

**Macquarie Capital**

**Sydney Metro Martin Place Integrated Station Development**

**Stage 2 SSDA Shadow Study – North Site**

**CSWSMP-MAC-SMA-UD-REP-000360**

**29 March 2019**

This report supports a State Significant Development (SSD) Development Application (DA) (SSD DA) submitted to the Minister for Planning (Minister) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on behalf of Macquarie Corporate Holdings Pty Limited (Macquarie), who is seeking to create a world class transport and employment precinct at Martin Place, Sydney.

The SSD DA seeks approval for the detailed design and construction of the North Site Over Station Development (OSD), located above and integrated with Metro Martin Place station (part of the NSW Government's approved Sydney Metro project). The northern entrance to Metro Martin Place station will front Hunter Street, Elizabeth Street and Castlereagh Street, with the North Site OSD situated above.

This shadow study has been prepared by Virtual Ideas to assess the overshadowing impacts of the Metro Martin Place station North Site OSD.

The Department of Planning and Environment has provided Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the SEARs as follows:

*provide a solar access and overshadowing analysis, comparing the overshadowing impacts of the proposal to the existing situation, the SLEP 2012 - Sun Access Planes and the approved envelopes at hourly intervals in mid-summer, mid-winter, 14 April and 31 August, and having particular regard to the impact of the proposal on solar access to Martin Place, Hyde Park and Pitt Street Mall.*

This report has also been prepared having regard to approved Concept Proposal (SSD 17\_8351) condition of consent B2 Overshadowing as follows:

### **Overshadowing**

*B2. Development of buildings pursuant to this consent shall:*

- b. identify opportunities to improve solar access to the ground plane of Martin Place (excluding the roadways and footpaths) between the hours of 12 and 2 pm (14 April), when compared to the shadow cast by the approved building envelope.*

### **Stage 2 SSD DA Shadow Study – North Tower**

In response to the SEARs, the enclosed shadow diagrams titled 'Stage 2 SSD DA Shadow Study – North Tower' show the shadows cast by the proposed North Tower OSD on:

- 21 December – hourly intervals from 9am to 3pm;
- 21 June – hourly intervals from 9am to 3pm;
- 14 April – hourly intervals from 9am to 3pm;
- 31 August – hourly intervals from 9am to 3pm; and
- 21 September – hourly intervals from 9am to 3pm.

These shadow diagrams show:

- the shadows cast by existing buildings (as per the City of Sydney city model);
- the outline of the shadow cast by the approved building envelope for the site (SSD 17\_8351); and
- the extent of shadow cast by the proposed North Site Stage 2 SSD DA OSD beyond the shadow cast by existing buildings (building model supplied by JPW) and within the approved building envelope.

### **Stage 2 SSD DA Shadow Study – North Tower: Martin Place**

The proposed North Tower OSD is required to comply with Condition B2(b) of the Concept Proposal. The enclosed shadow diagrams titled 'Stage 2 SSD DA Shadow Study – North Tower: Martin Place' demonstrate how the design of the proposed South Site OSD complies with condition B2(b). These shadow diagrams show shadows cast by the proposed North Tower OSD on 14 April – 15 minute intervals from 12pm to 2pm. The extent of Martin Place depicted in the plans is extrapolated from the Sydney Local Environmental Plan 2012's Sun Access Protection Maps and exclude roads and footpaths, consistent with Condition B2(b) of the Concept Proposal.

These shadow diagrams show:

- the shadows cast by existing buildings (as per the City of Sydney city model)
- the shadow cast by the approved North Tower building envelope beyond existing buildings; and
- the shadow cast by the proposed North Site Stage 2 SSD DA OSD (building model supplied by JPW) beyond existing buildings and within the approved envelope.

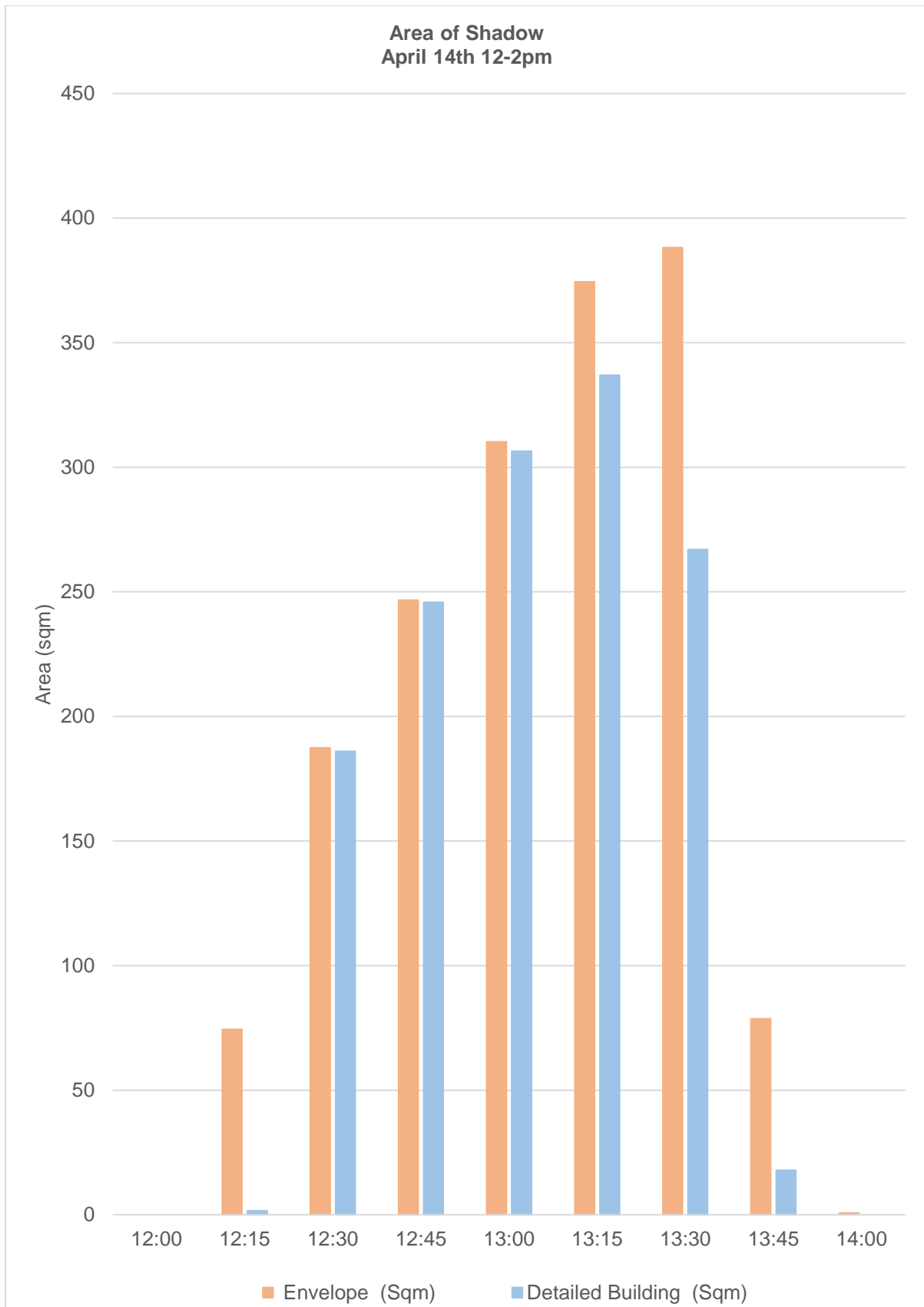
These shadow diagrams demonstrate the improvements in solar access to the ground plane of Martin Place that the proposed North Site Stage 2 SSD DA OSD creates when compared to the approved building envelope. The improvements to solar access to the ground plane of Martin Place created by the proposed North Site Stage 2 SSD DA OSD compared to the approved building envelope have also been measured in square metres at each of the 15 minute intervals from 12pm to 2pm. Table 1 below shows:

- the area of shadow cast by the approved building envelope on Martin Place beyond existing buildings at each 15 minute interval from 12pm to 2pm;
- the cumulative area of shadow cast by the approved building envelope on Martin Place beyond existing buildings at 15 minute increments from 12pm to 2pm;
- the area of shadow cast by the proposed North Site Stage 2 SSD DA OSD on Martin Place beyond existing buildings at each 15 minute interval from 12pm to 2pm;
- the cumulative area of shadow cast by the proposed North Site Stage 2 SSD DA OSD on Martin Place beyond existing buildings at 15 minute increments from 12pm to 2pm;
- the reduction in the area of shadow cast on Martin Place beyond existing buildings by the approved building envelope and the proposed North Site Stage 2 SSD DA OSD at each 15 minute interval from 12pm to 2pm; and
- the reduction in the cumulative area of shadow on Martin Place beyond existing buildings between the approved building envelope and the proposed North Site Stage 2 SSD DA OSD at 15 minute increments from 12pm to 2pm.

Overall, the shadows cast by the proposed North Site Stage 2 SSD DA OSD provide **299.04m<sup>2</sup>** of additional solar access to the ground plane of Martin Place when compared to shadows cast by the approved building envelope. The additional solar access to Martin Place equates to just over 18% more additional direct sunlight between 12pm and 2pm on 14 April when compared to the approved building envelope and therefore meets the requirements of Condition B2(b).

Time	Envelope (Sqm)	Detailed Building (Sqm)	Increase in solar access to Martin Place between Approved Envelope and Proposed Building (Sqm)
12:00	<b>0</b>	<b>0</b>	0
12:15	<b>74.4</b>	<b>1.6</b>	72.8
12:30	<b>187.4</b>	<b>186</b>	1.4
12:45	<b>246.7</b>	<b>245.8</b>	0.9
13:00	<b>310.2</b>	<b>306.5</b>	3.7
13:15	<b>374.5</b>	<b>337</b>	37.5
13:30	<b>388.2</b>	<b>267</b>	121.2
13:45	<b>78.7</b>	<b>17.86</b>	60.84
14:00	<b>0.7</b>	<b>0</b>	0.7
<b>Cumulative Total Area (Sqm)</b>	<b>1660.8</b>	<b>1361.76</b>	<b>299.04</b>

Table 1: Comparative analysis of shadow cast by approved envelope and proposed building 14 April



*Figure 1: Comparison of shadow cast on Martin Place by approved envelope and proposed building*





Stage 2 SSD DA Shadow Study - North Tower

14 April, 9:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

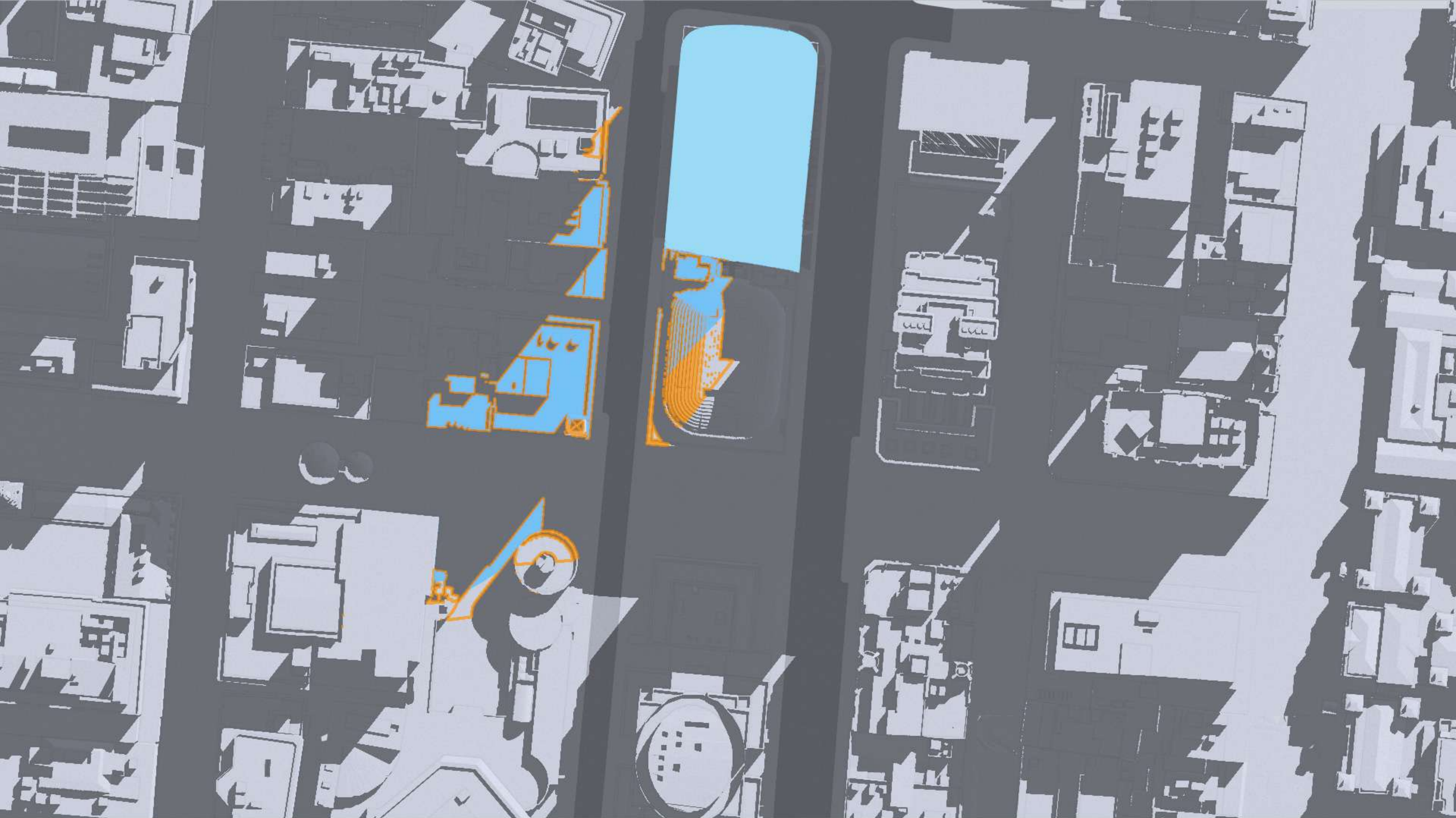


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

14 April, 10:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

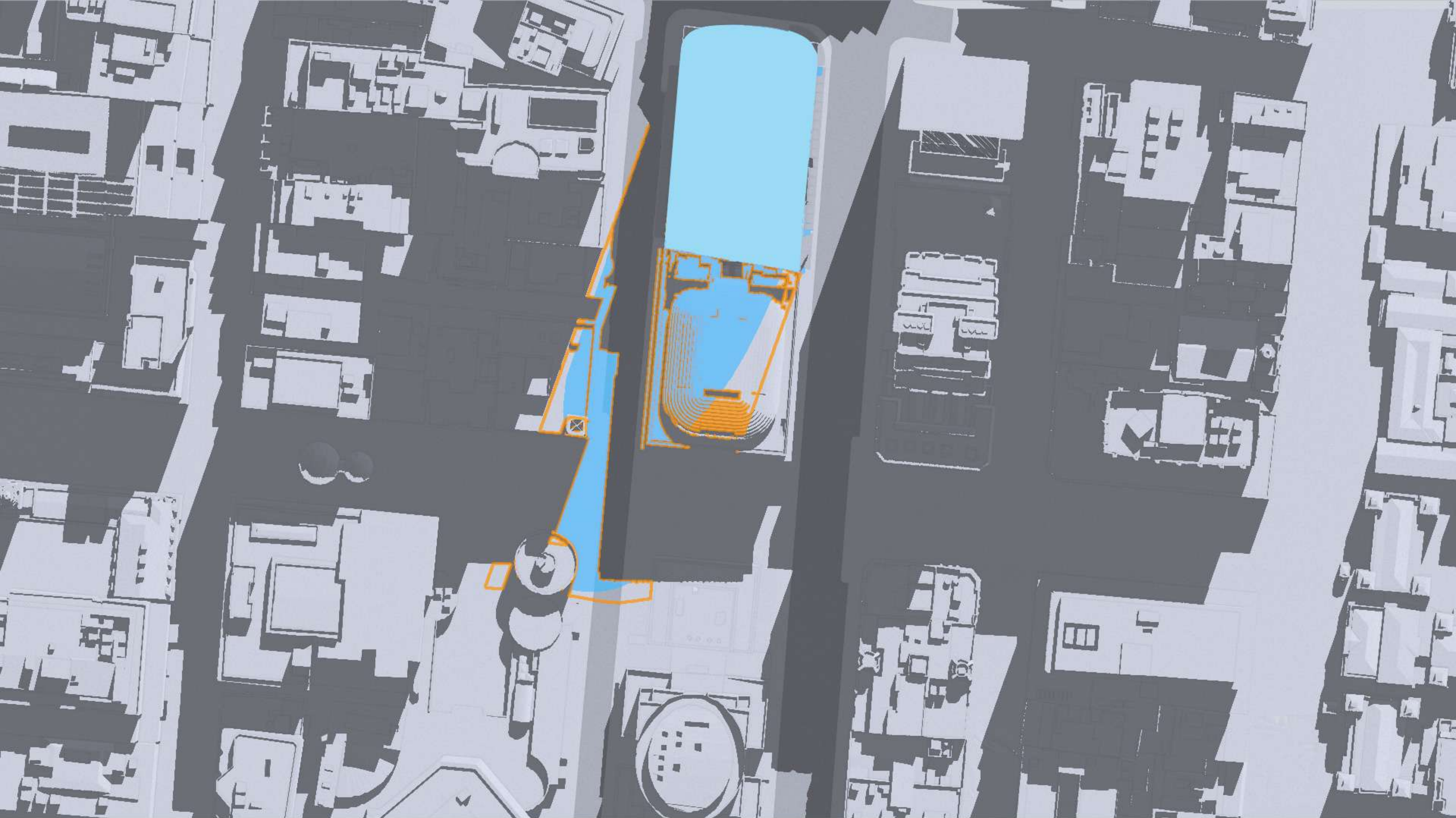


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

14 April, 11:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

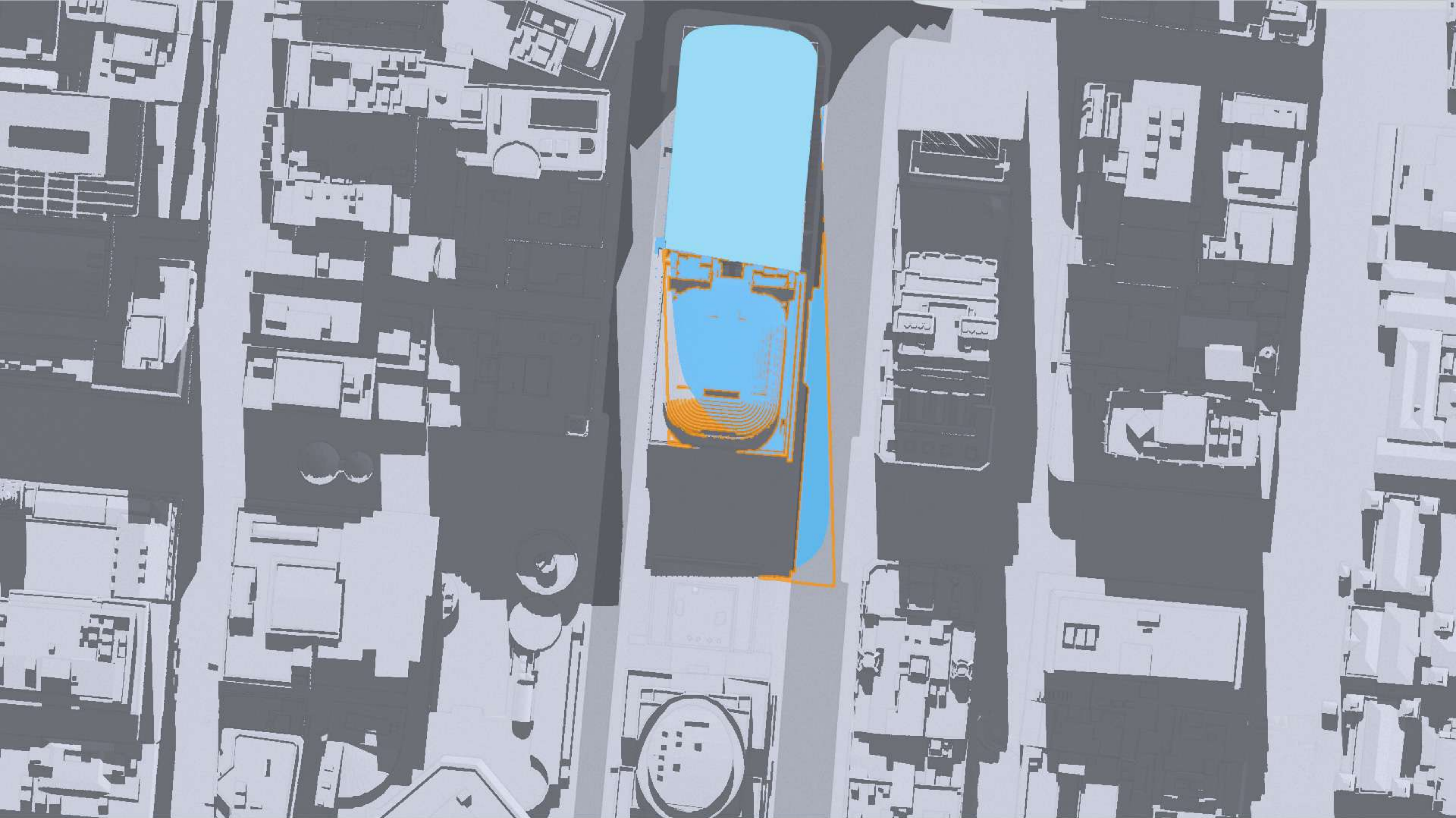


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

14 April, 12:00 PM AEST

 Stage 2 SSD DA North Tower footprint

 Shadows cast by existing buildings

 Outline of shadow cast by North Site Stage 1 SSD DA building envelope

 Stage 2 SSD DA North Tower extent of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

14 April, 1:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

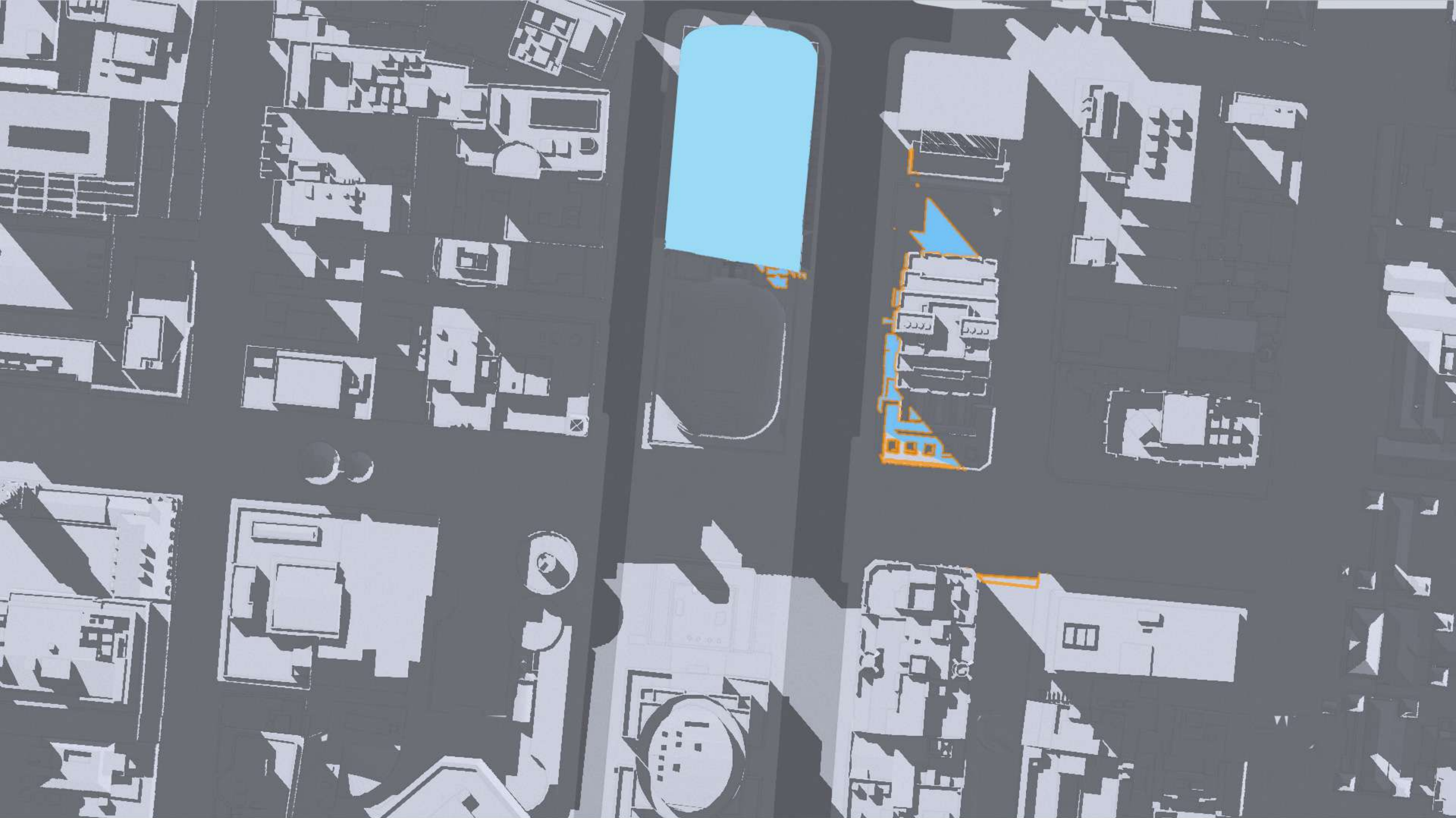


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

14 April, 2:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

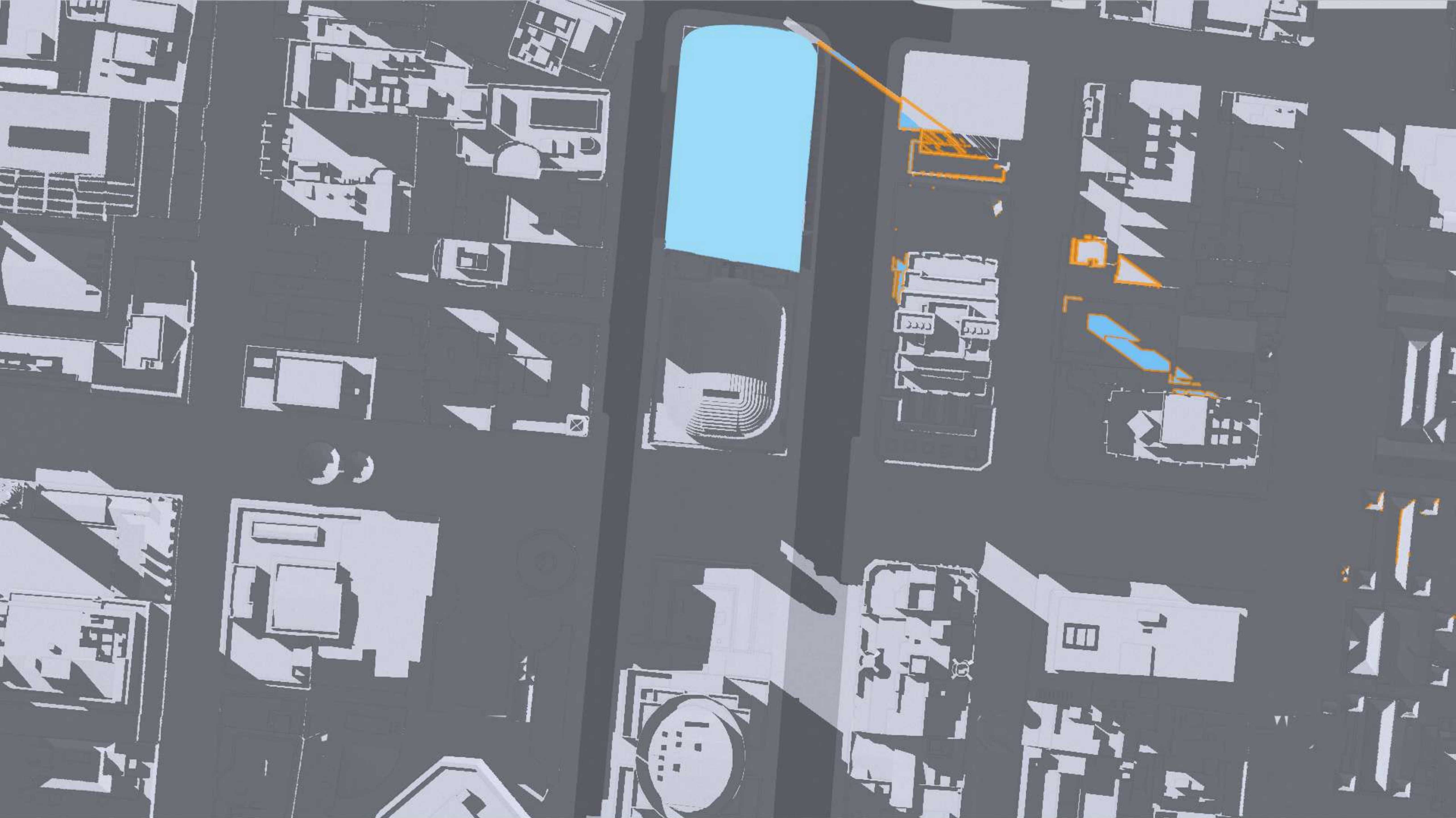


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

14 April, 3:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings



Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 June, 9:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings



Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 June, 10:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

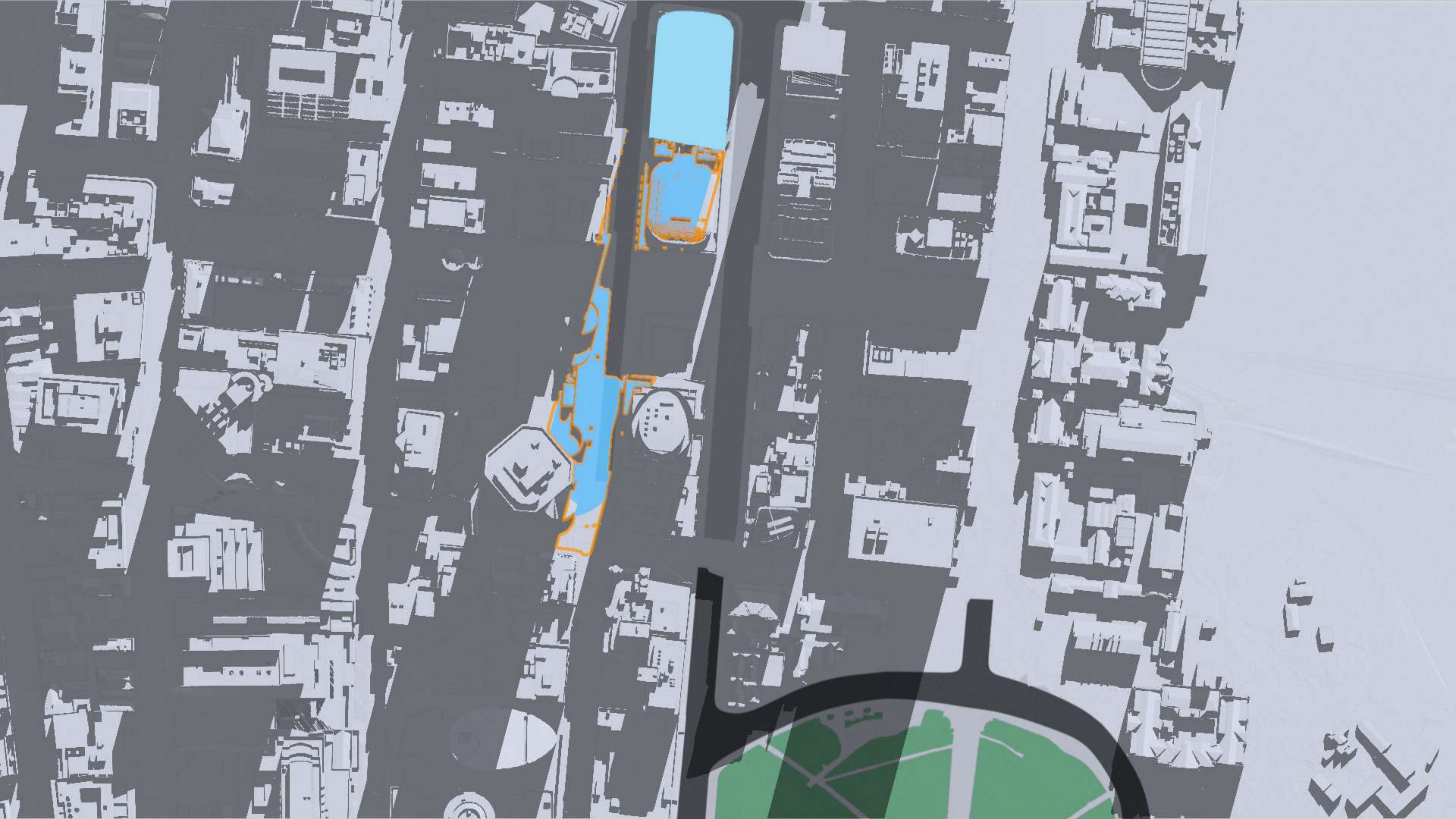


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 June, 11:00 AM AEST

- Stage 2 SSD DA North Tower footprint
- Shadows cast by existing buildings
- Outline of shadow cast by North Site Stage 1 SSD DA building envelope
- Stage 2 SSD DA North Tower extent of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 June, 12:00 PM AEST

-  Stage 2 SSD DA North Tower footprint
-  Shadows cast by existing buildings
-  Outline of shadow cast by North Site Stage 1 SSD DA building envelope
-  Stage 2 SSD DA North Tower extent of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 June, 1:00 PM AEST







Stage 2 SSD DA Shadow Study - North Tower

21 June, 2:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings



Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 June, 3:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings



Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings



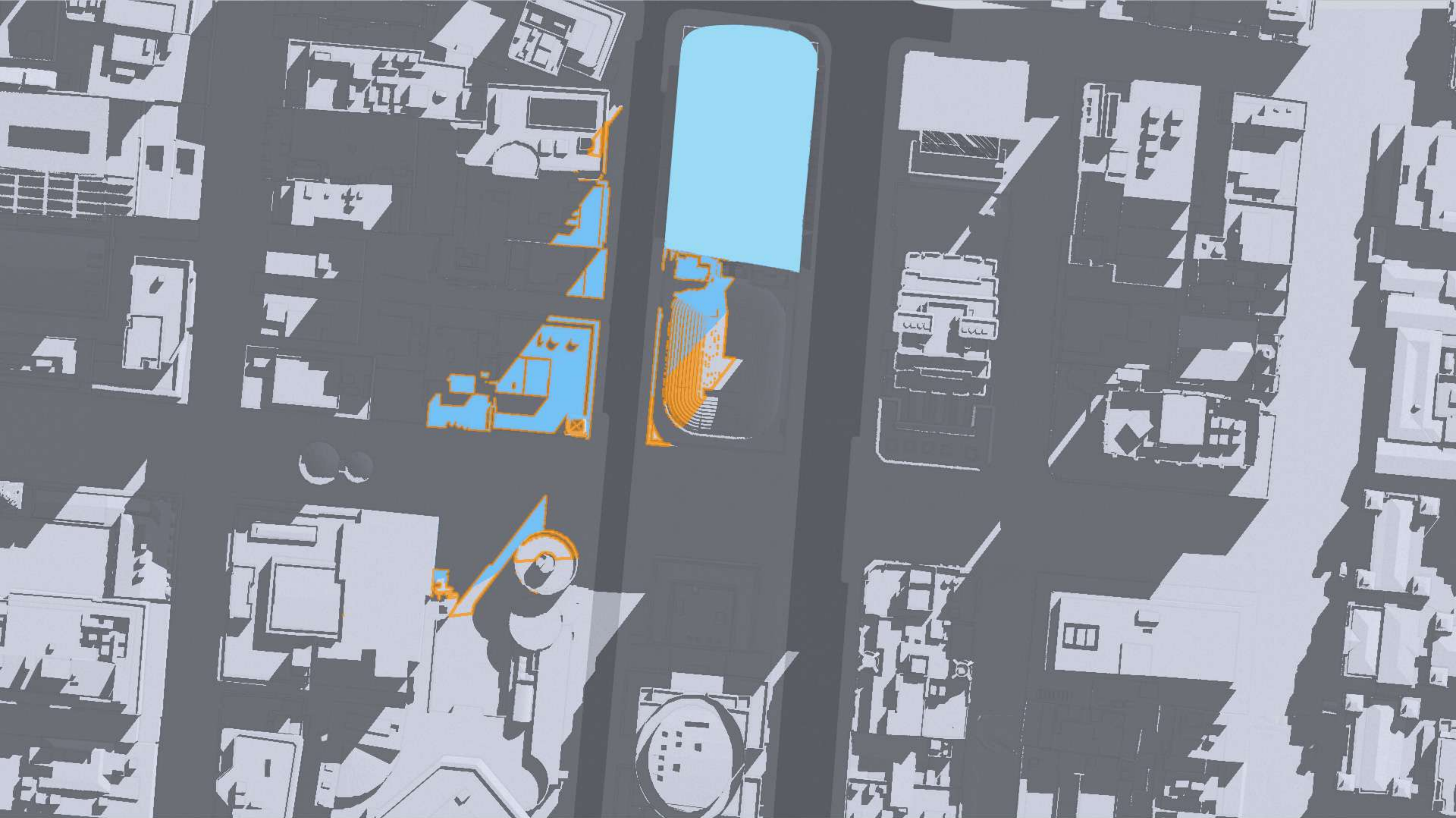


Stage 2 SSD DA Shadow Study - North Tower

31 August, 9:00 AM AEST







Stage 2 SSD DA Shadow Study - North Tower

31 August, 10:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

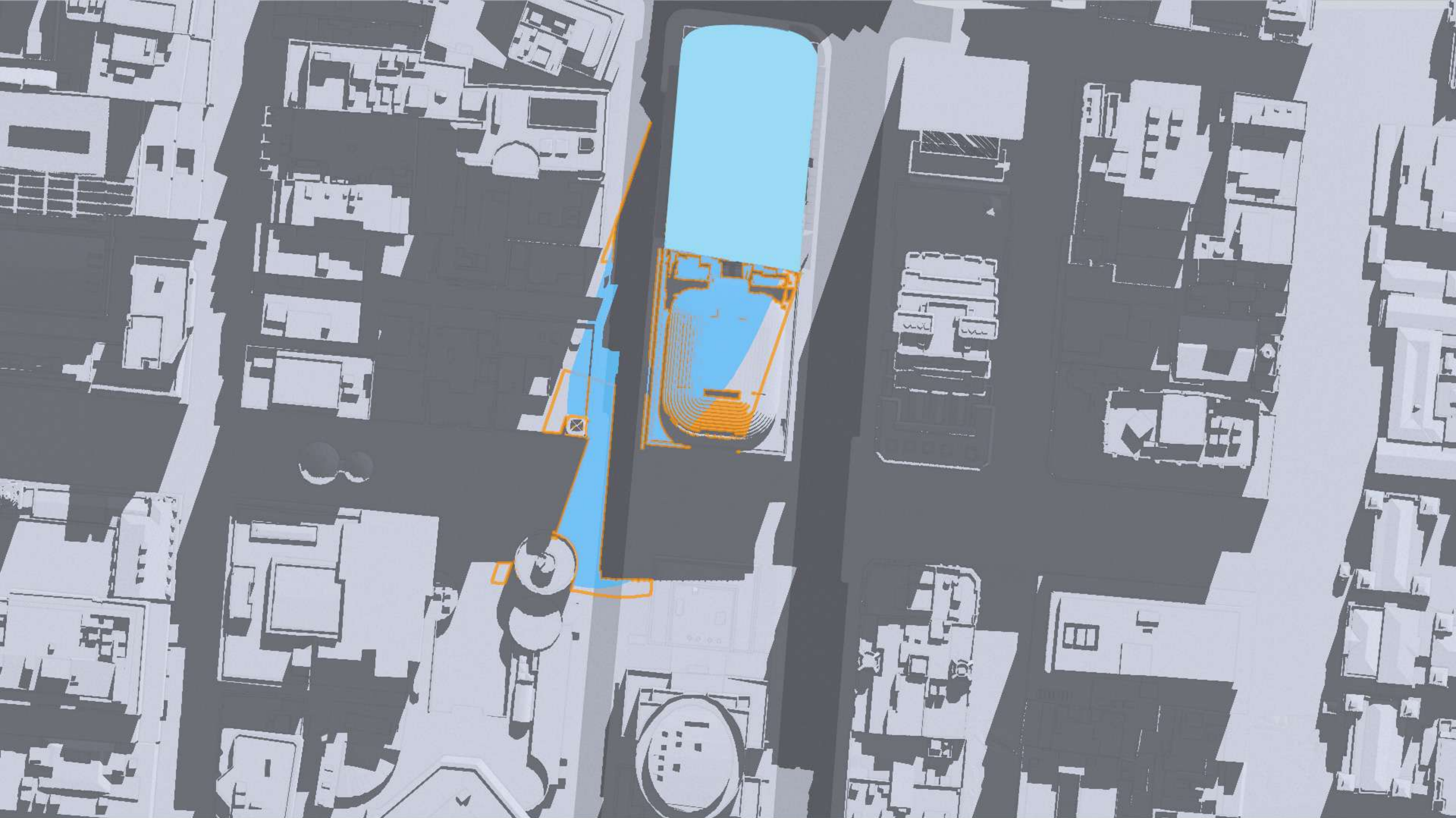


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

31 August, 11:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

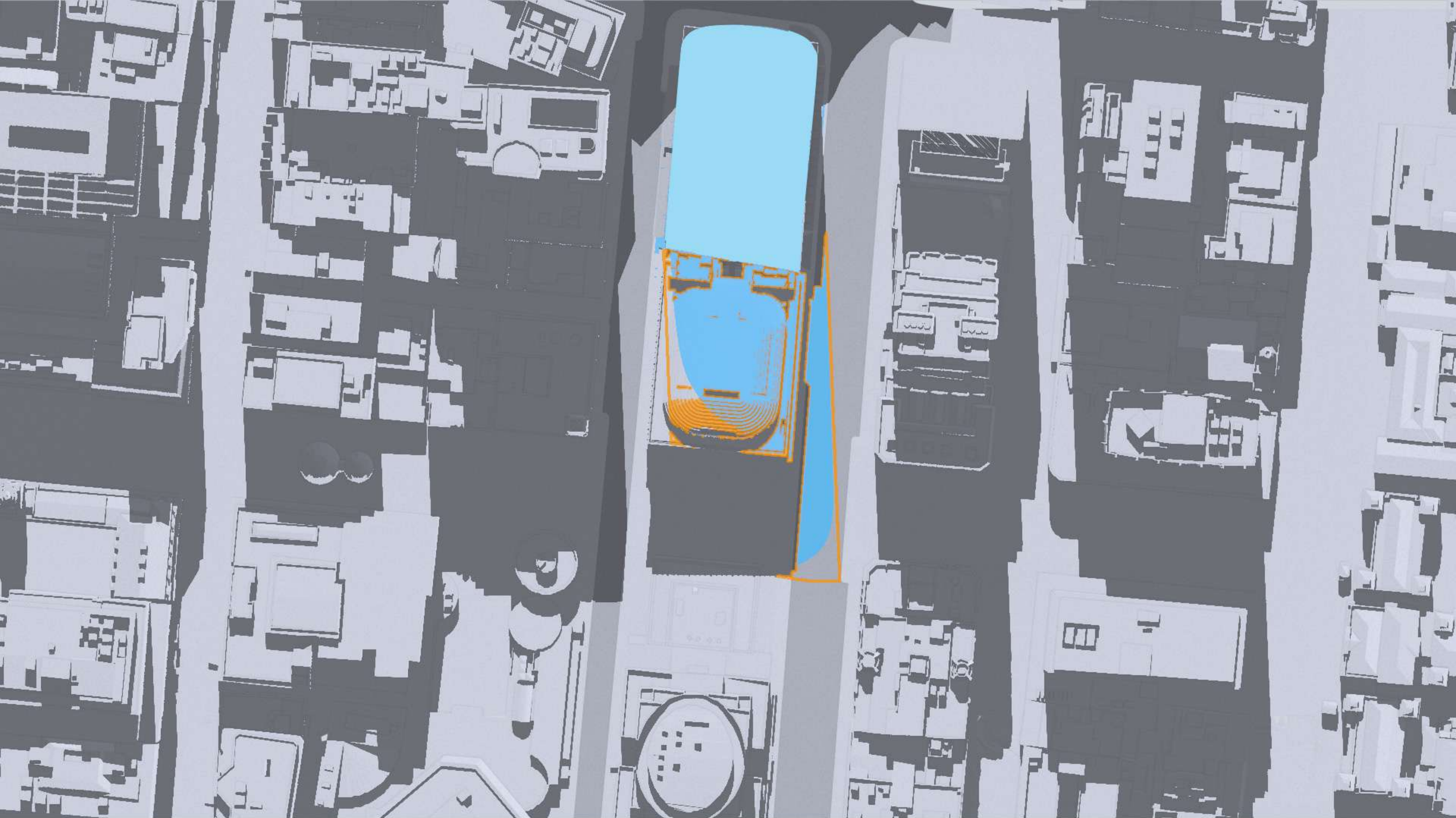


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

31 August, 12:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

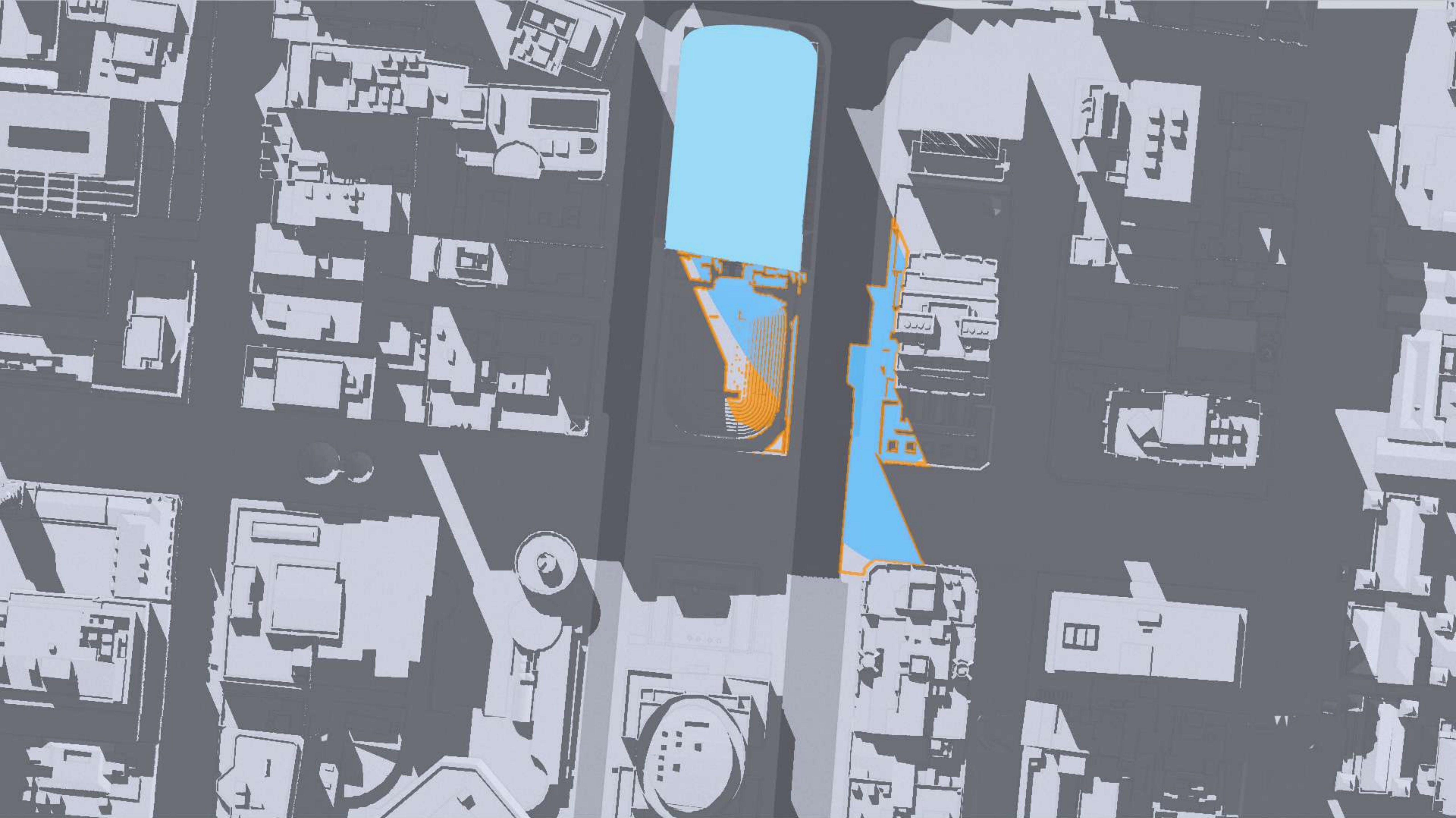


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings



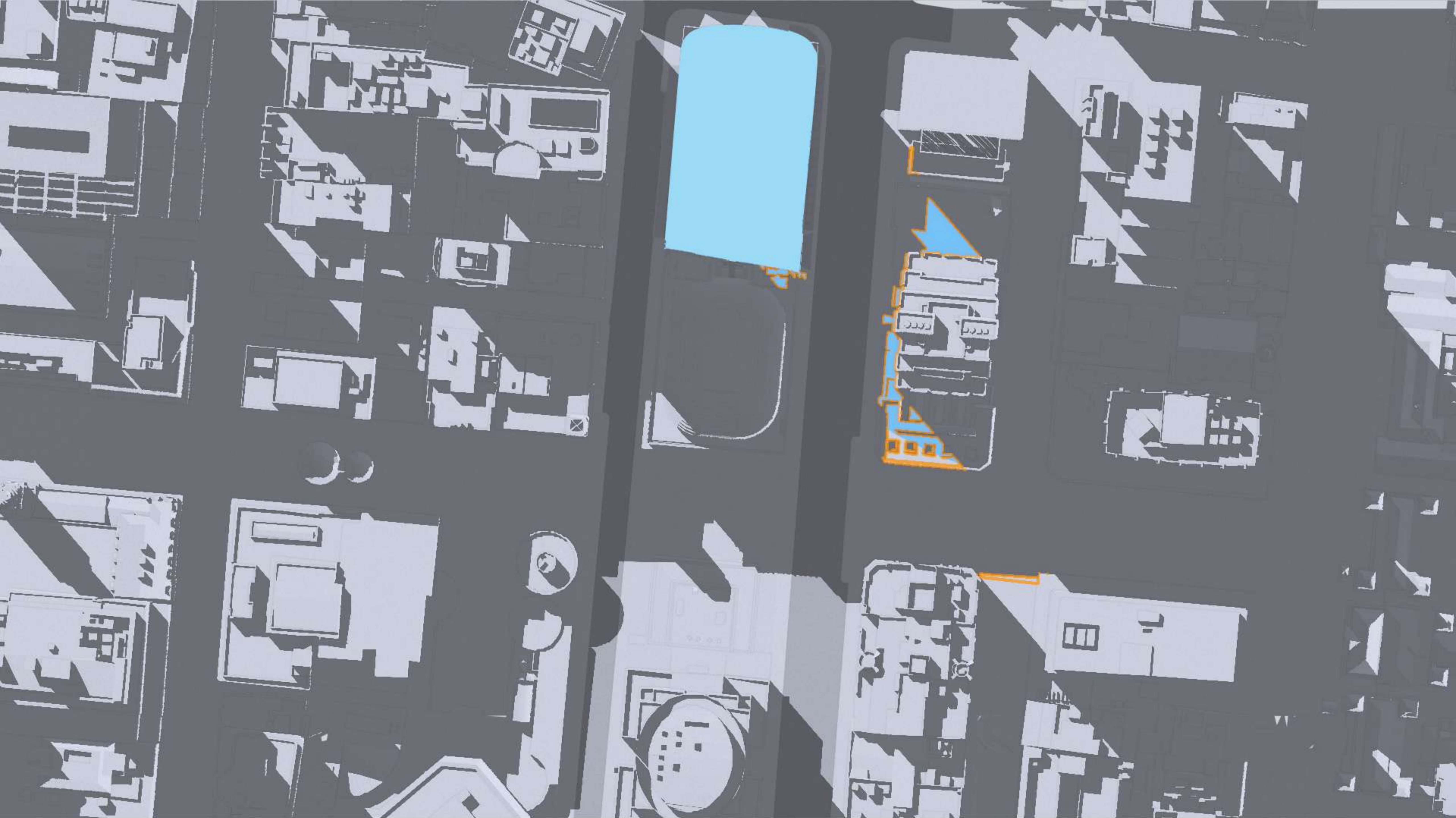


Stage 2 SSD DA Shadow Study - North Tower

31 August, 1:00 PM AEST







Stage 2 SSD DA Shadow Study - North Tower

31 August, 2:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

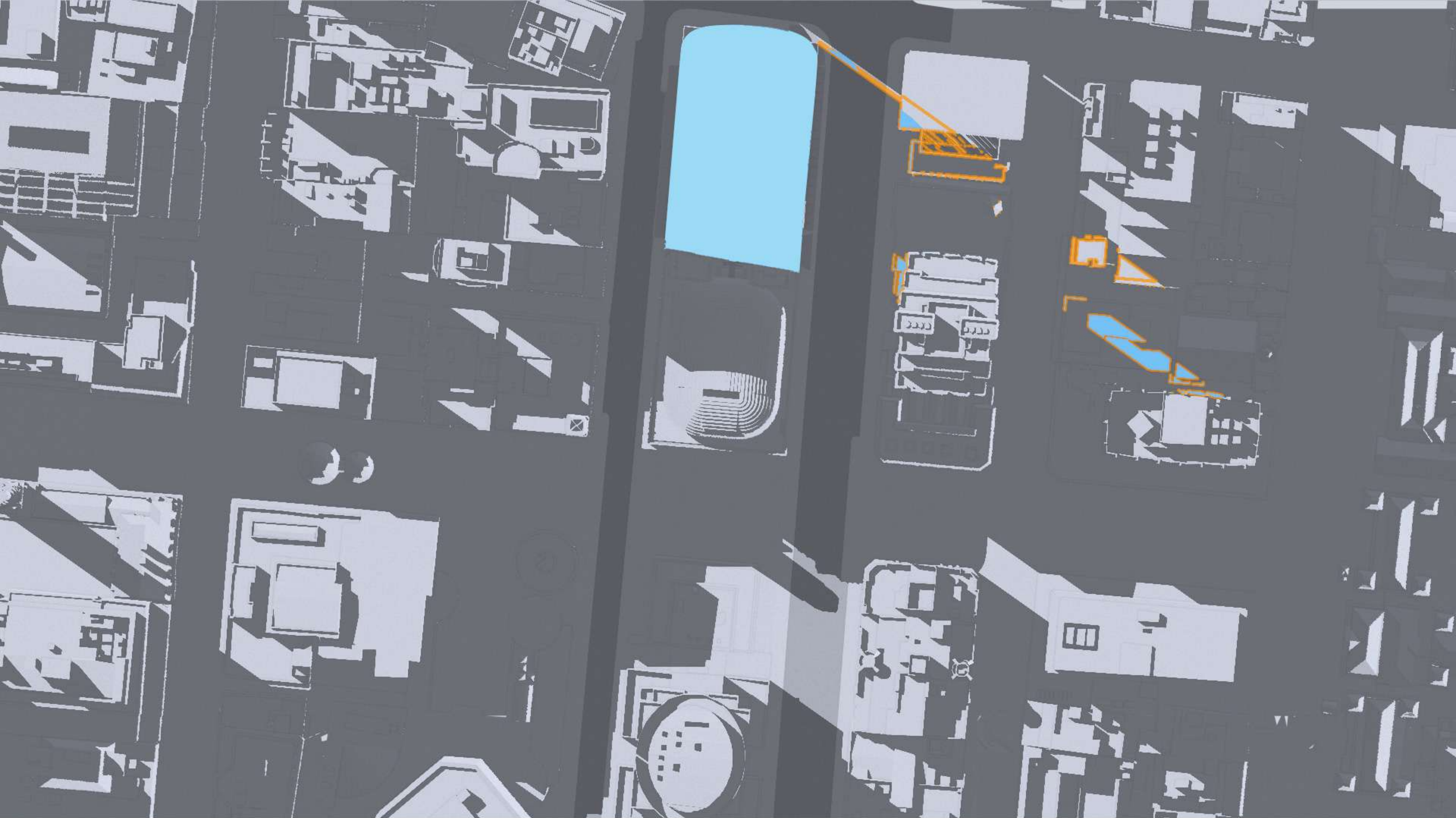


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

31 August, 3:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

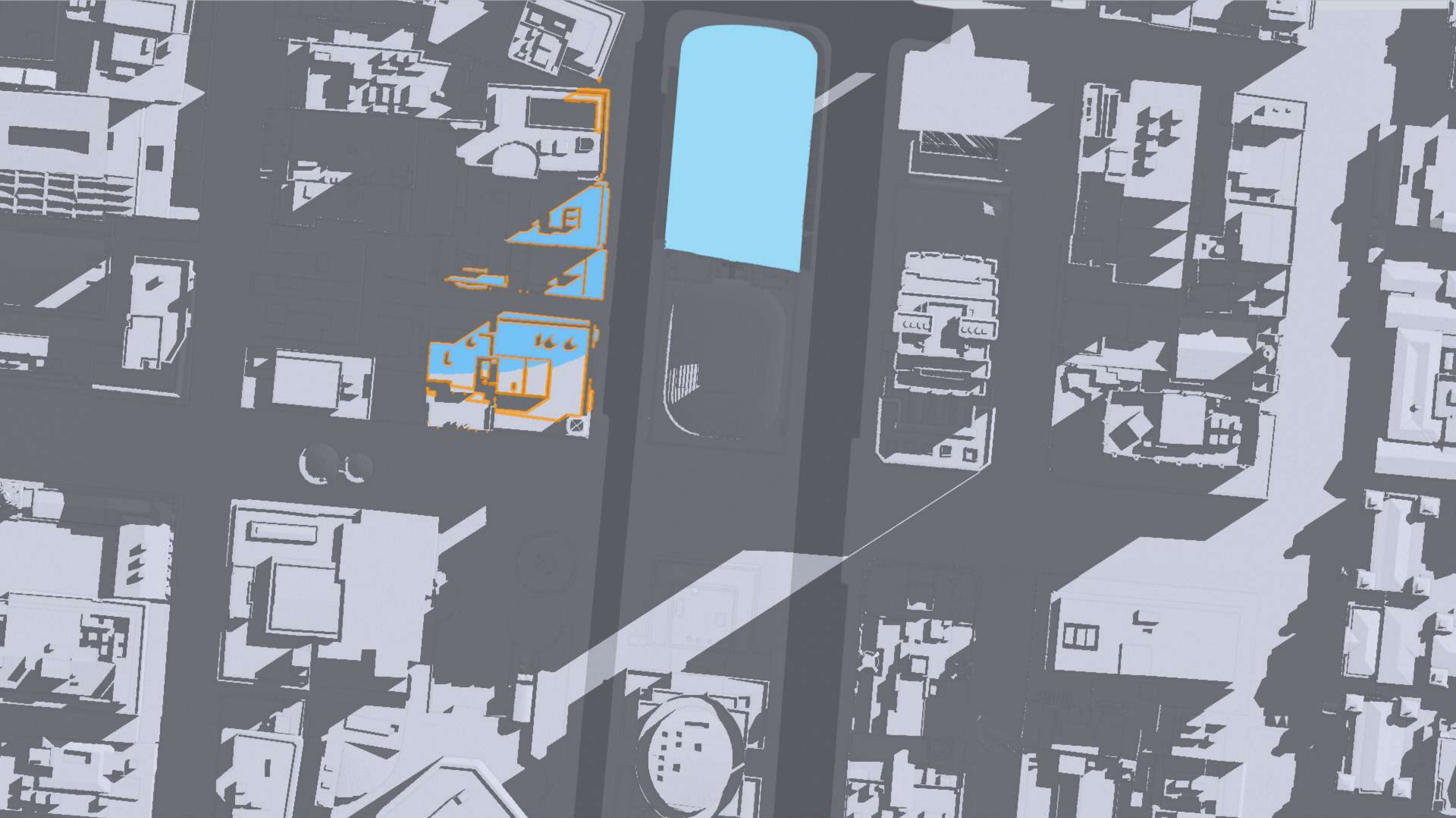


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 September, 9:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

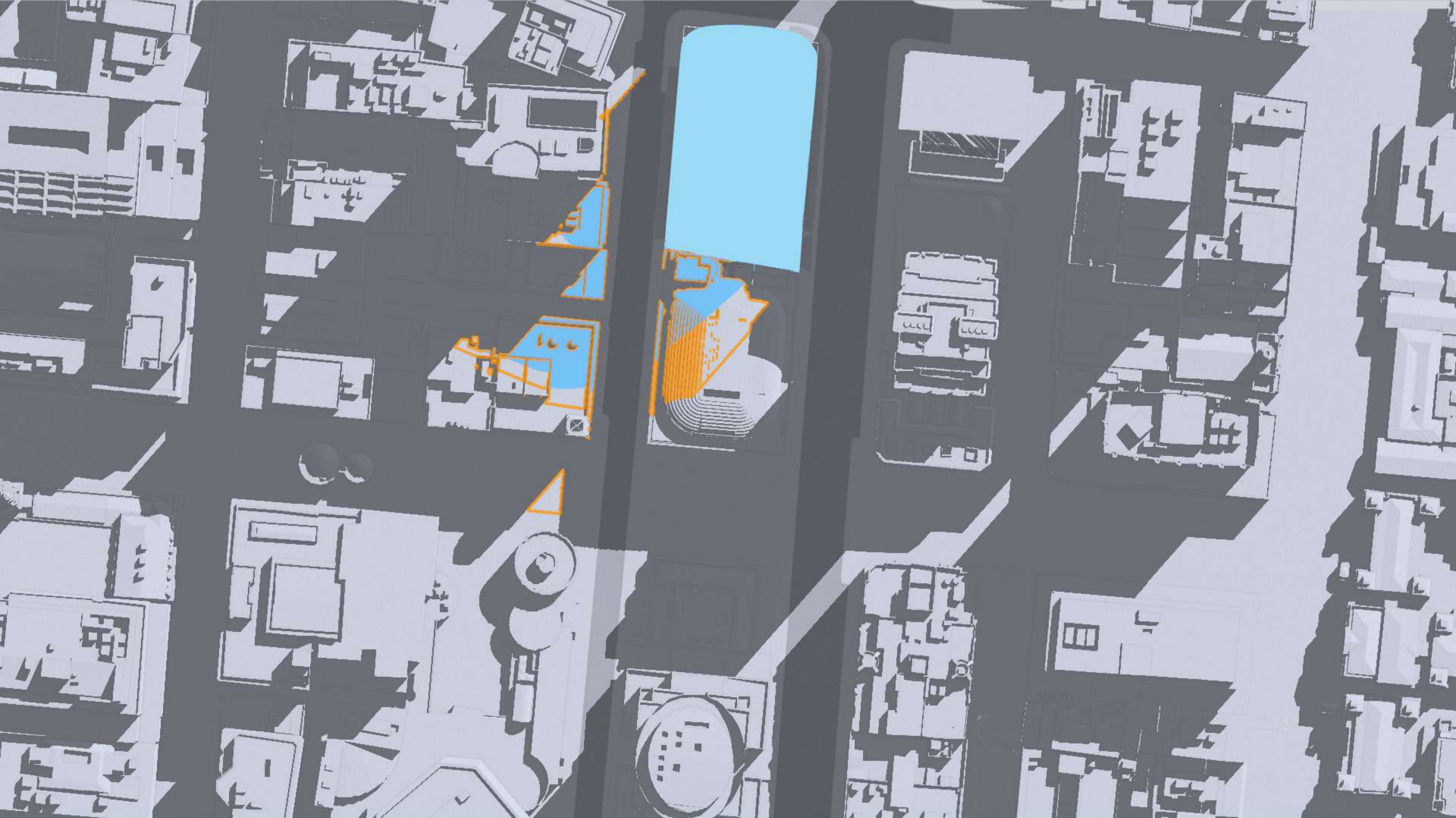


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 September, 10:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings



Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 September, 11:00 AM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

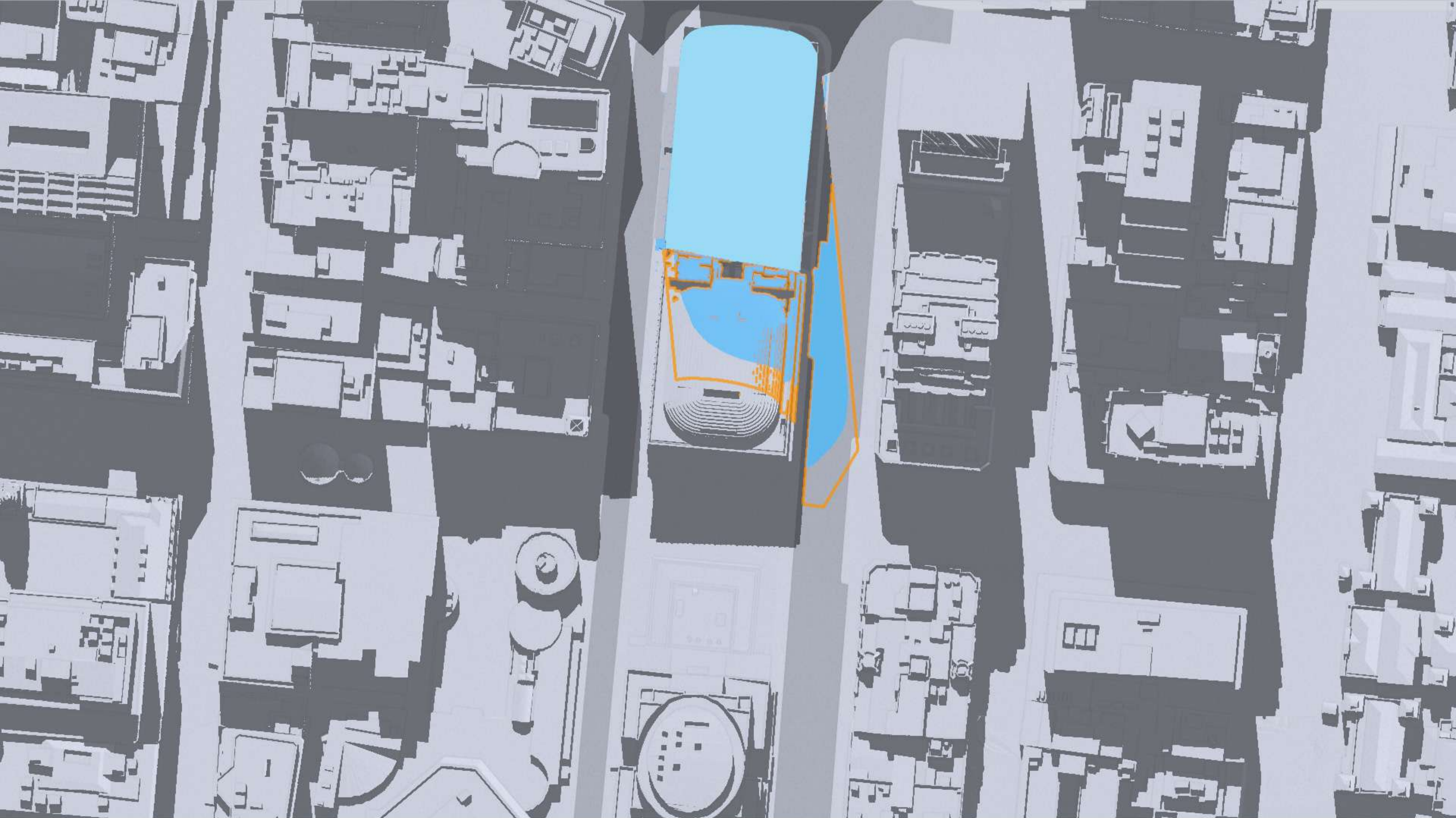


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 September, 12:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

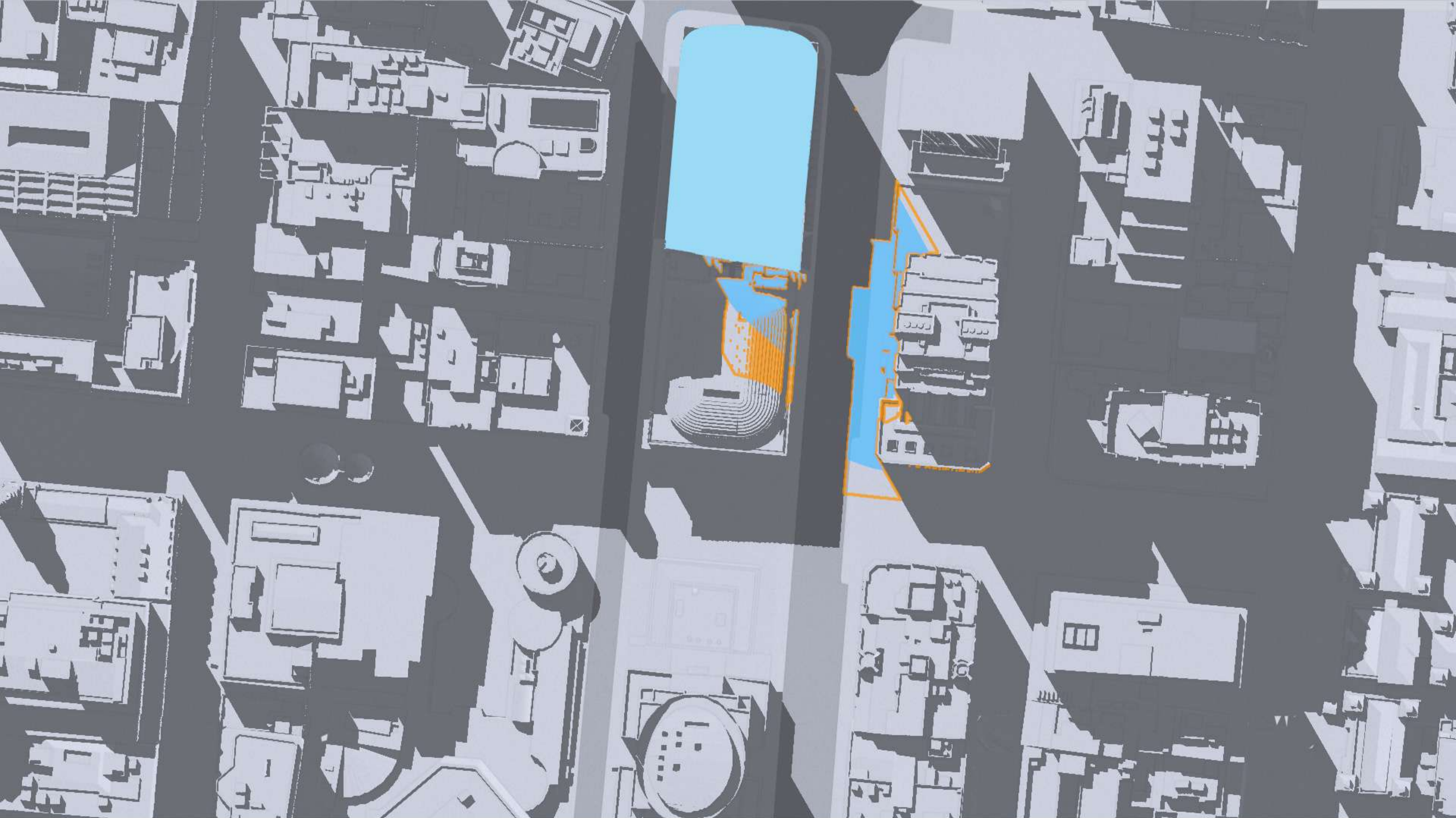


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 September, 1:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

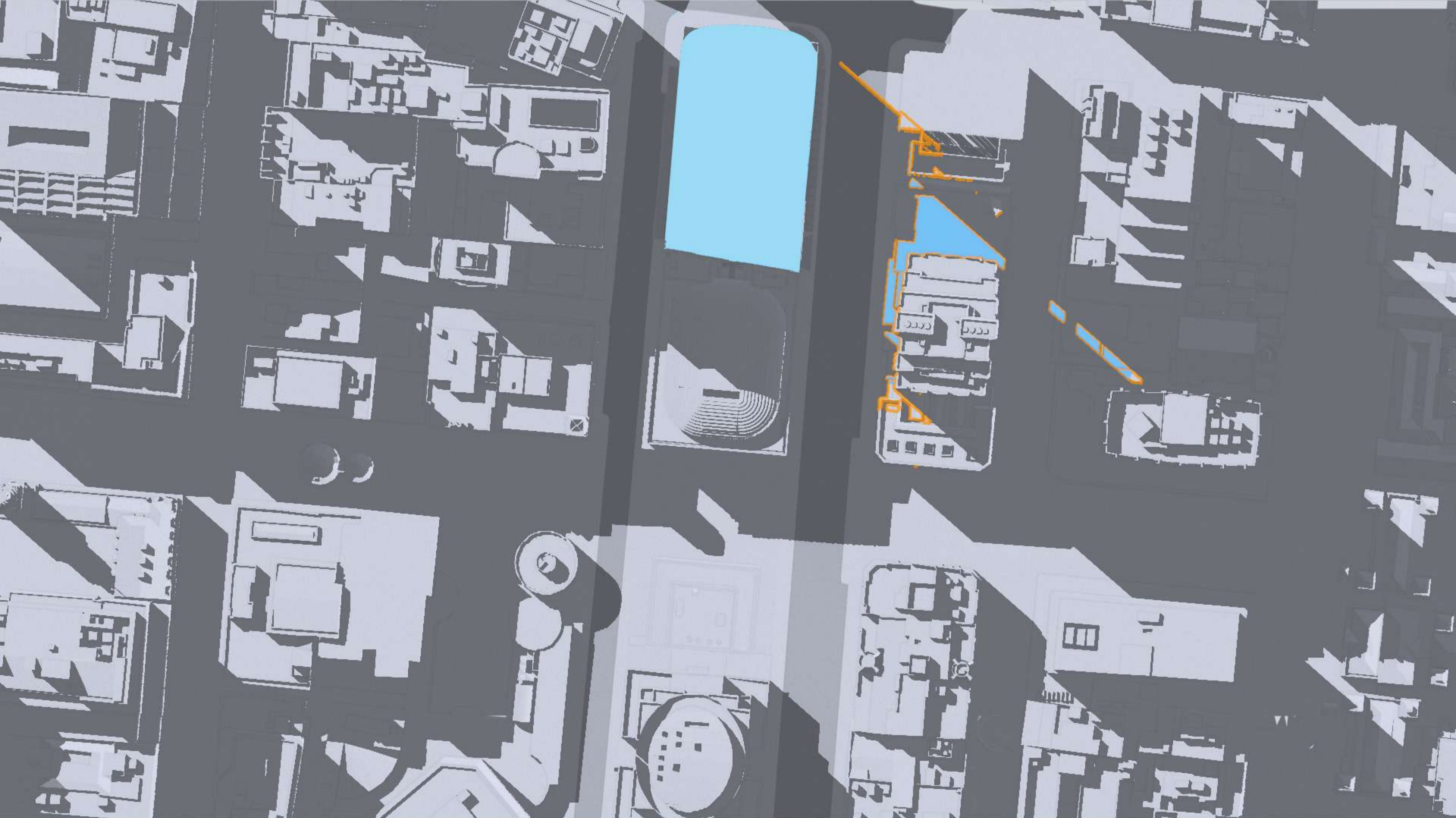


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 September, 2:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

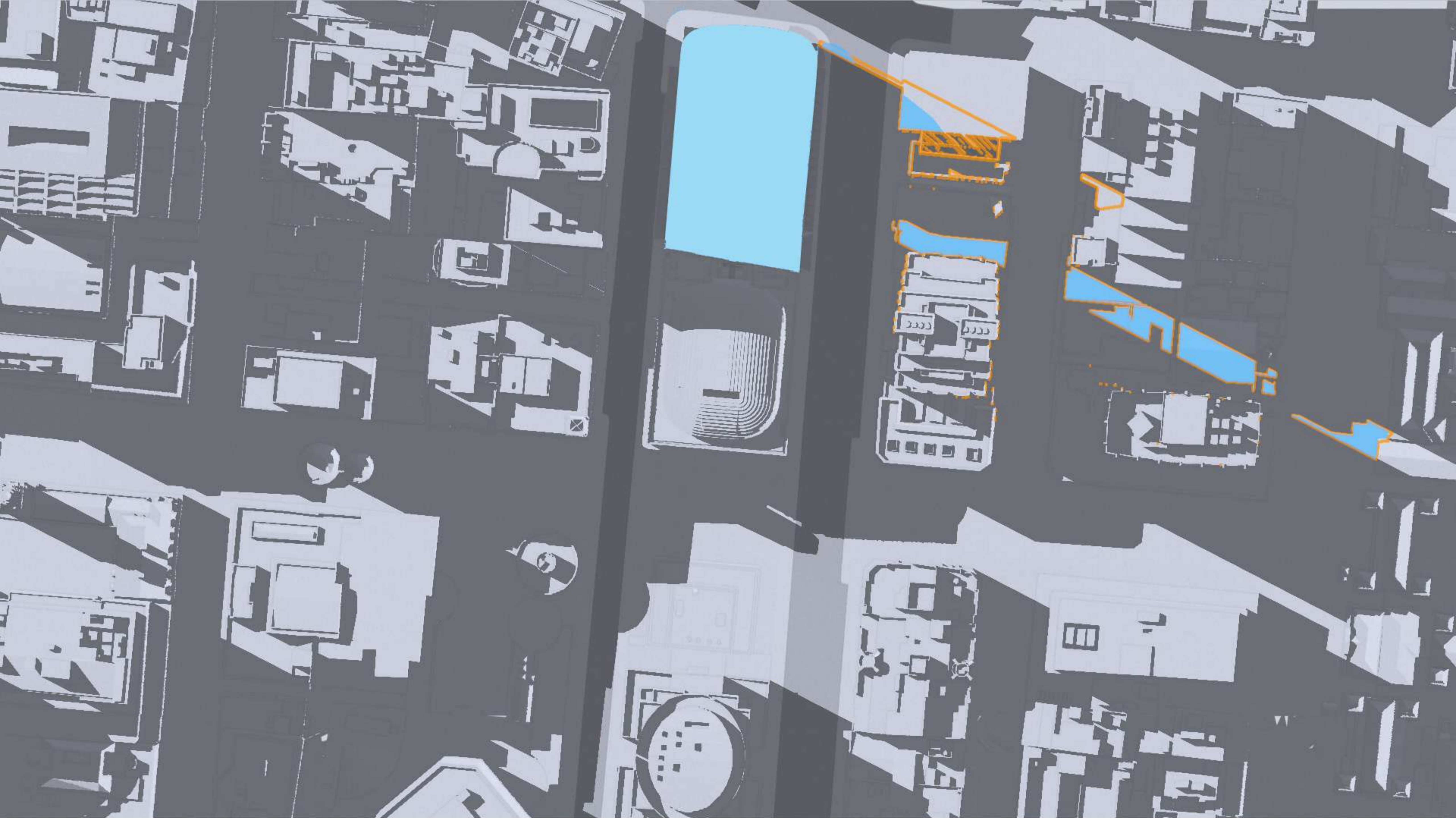


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 September, 3:00 PM AEST



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

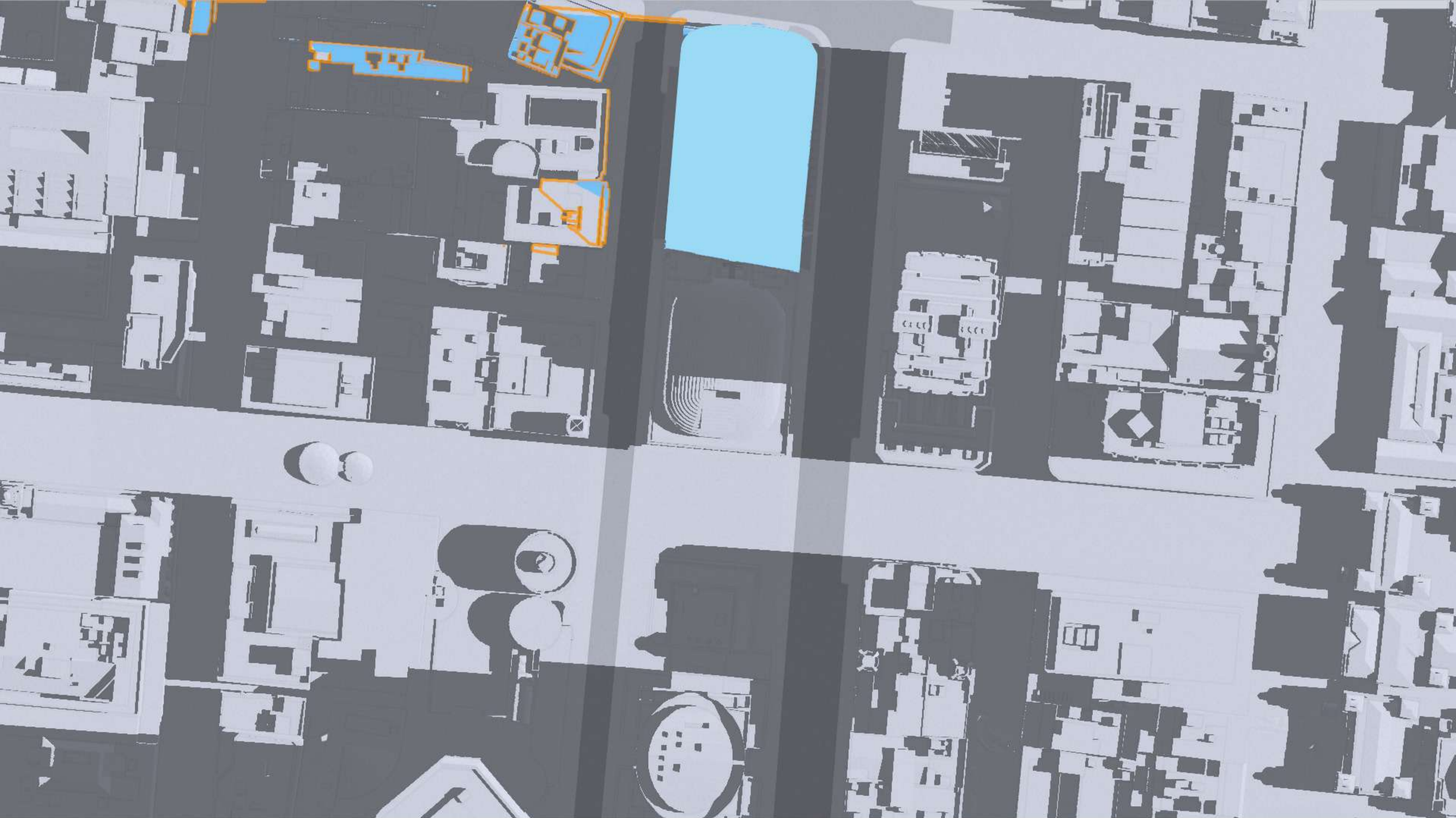


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 December, 9:00 AM AEDT



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings



Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 December, 10:00 AM AEDT



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

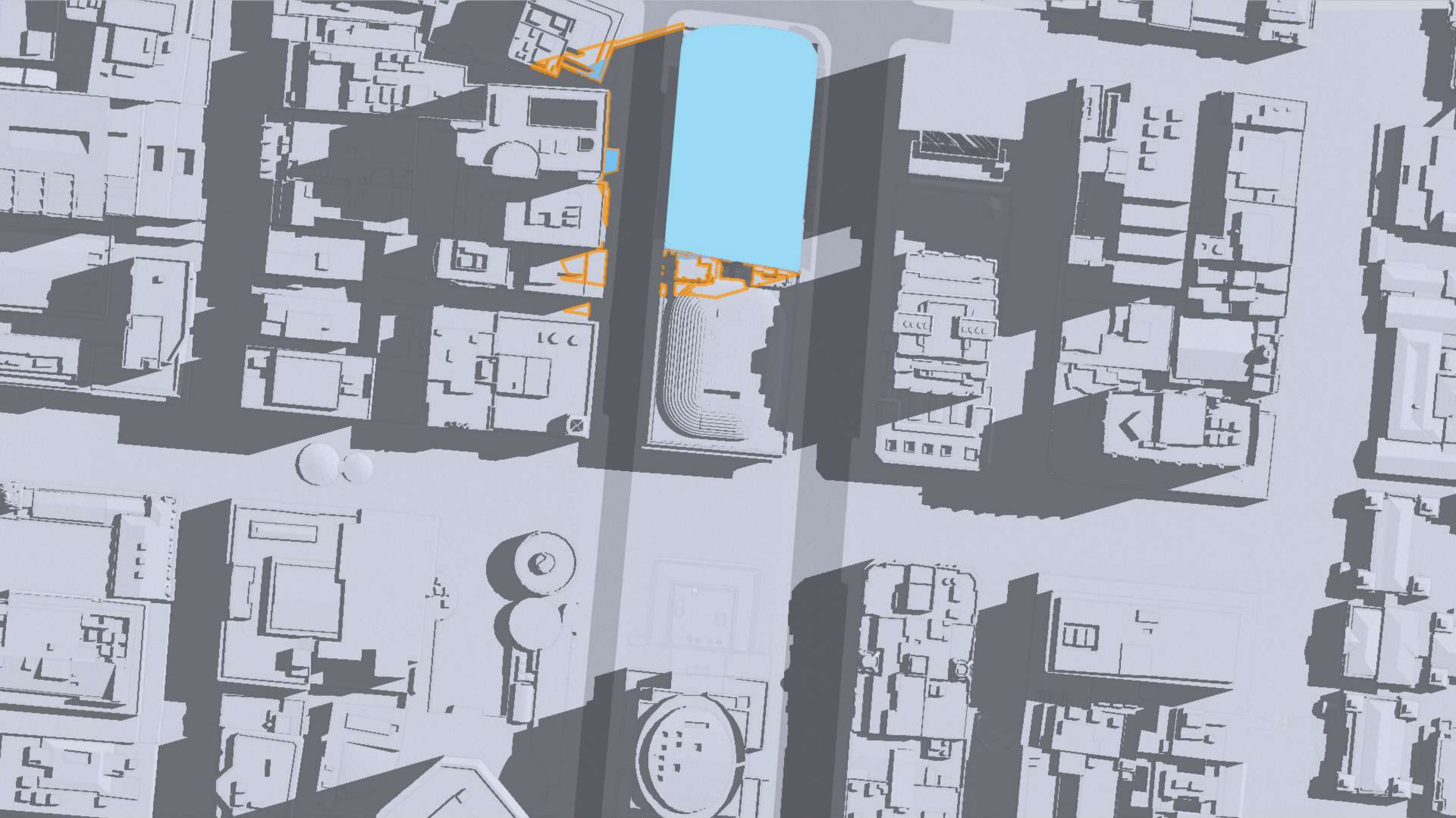


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 December, 11:00 AM AEDT



Stage 2 SSD DA North Tower footprint



Shadows cast by existing buildings



Outline of shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 December, 12:00 PM AEDT



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

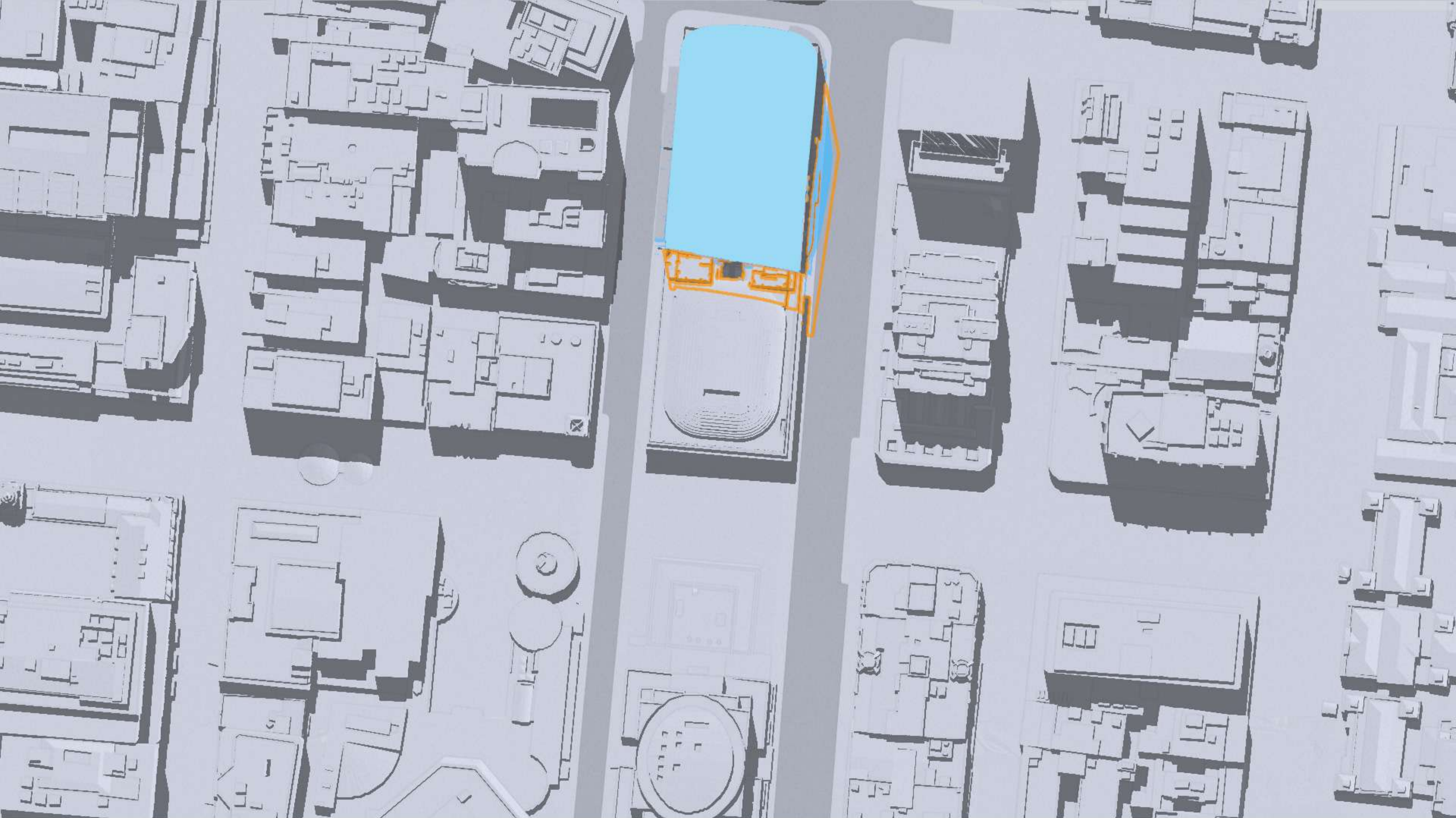


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 December, 1:00 PM AEDT



Stage 2 SSD DA North Tower footprint



Shadows cast by existing buildings

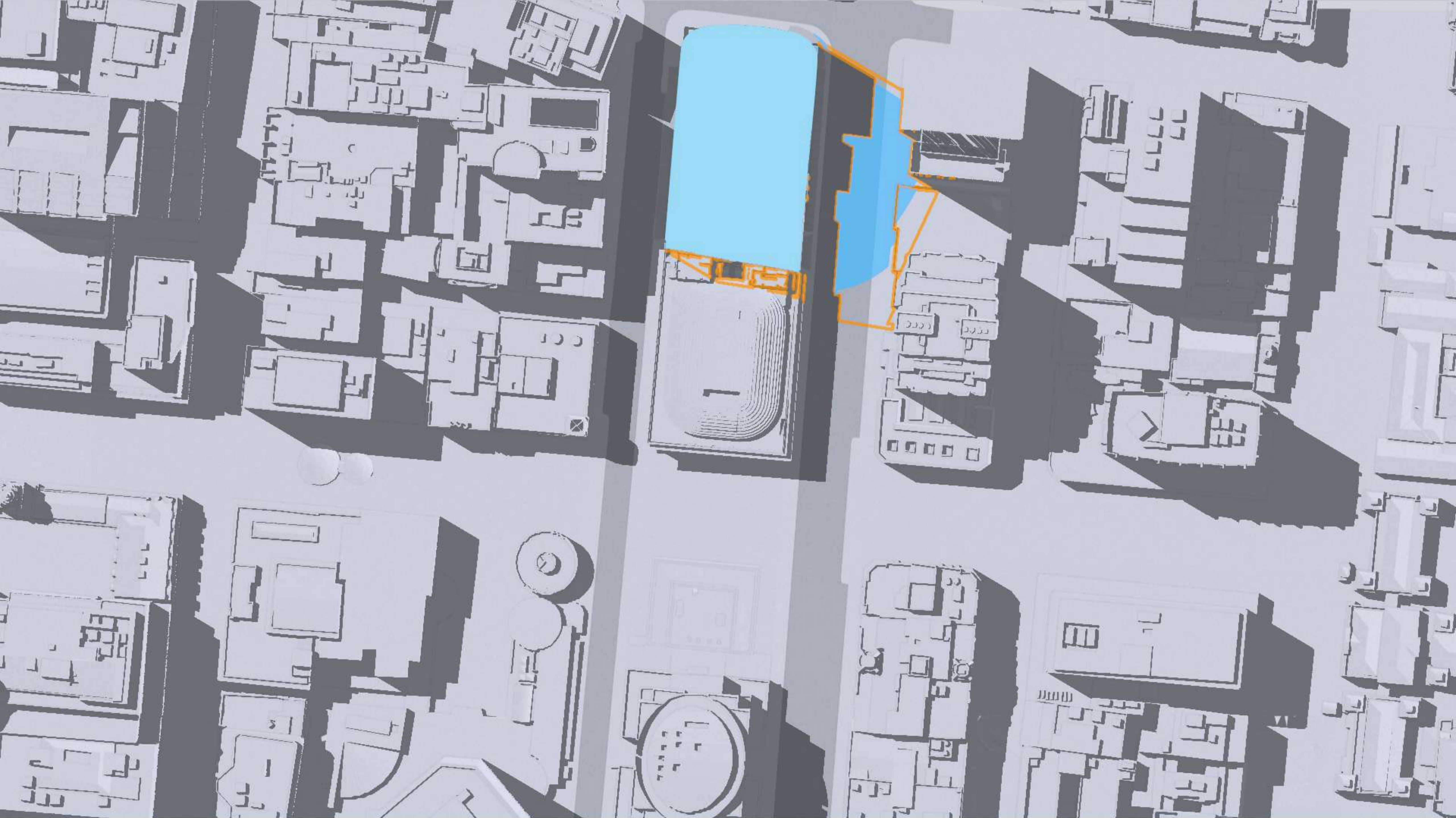


Outline of shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 December, 2:00 PM AEDT

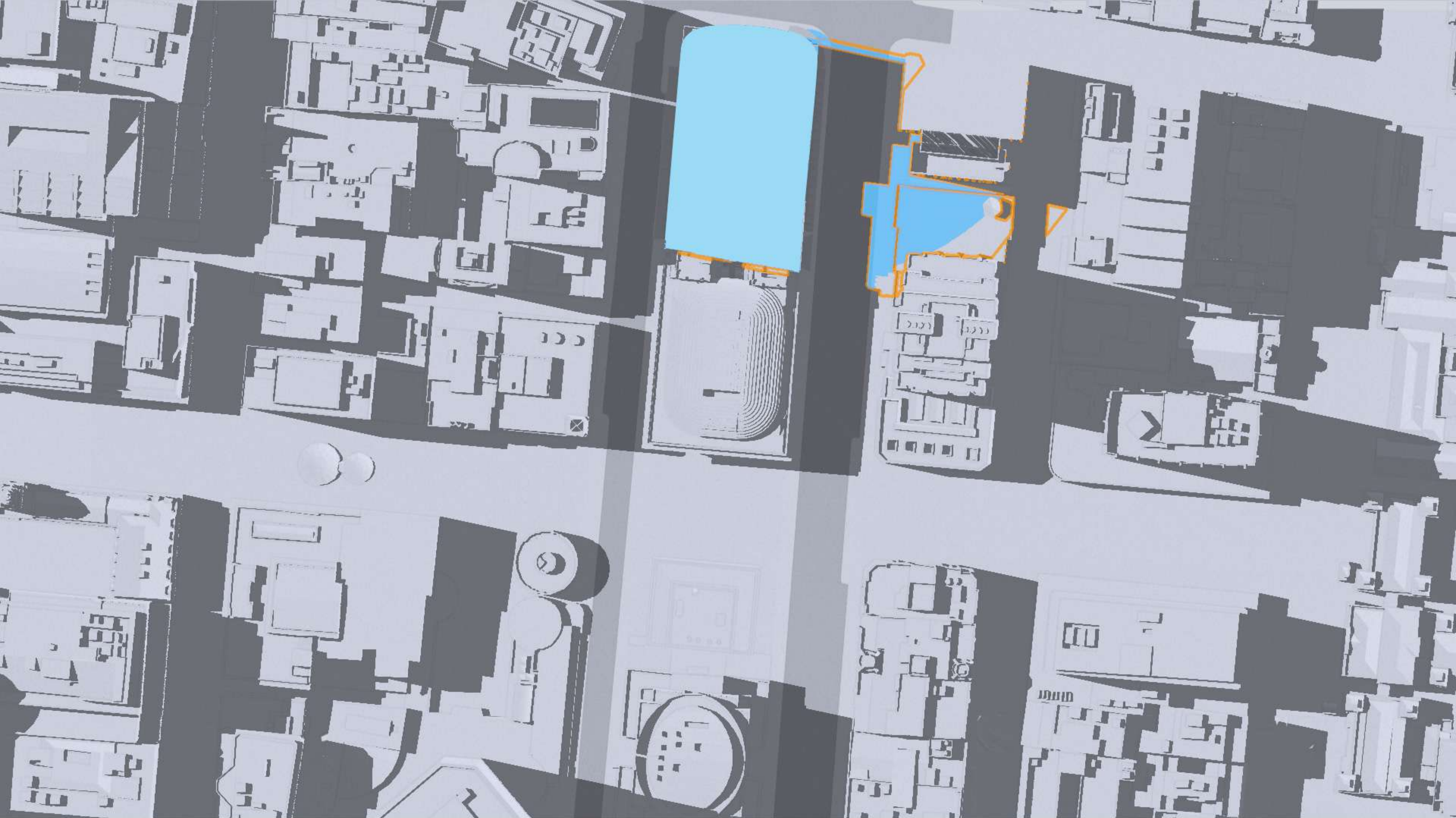
 Stage 2 SSD DA North Tower footprint

 Shadows cast by existing buildings

 Outline of shadow cast by North Site Stage 1 SSD DA building envelope

 Stage 2 SSD DA North Tower extent of shadow beyond existing buildings





Stage 2 SSD DA Shadow Study - North Tower

21 December, 3:00 PM AEDT



Stage 2 SSD DA North  
Tower footprint



Shadows cast by existing  
buildings

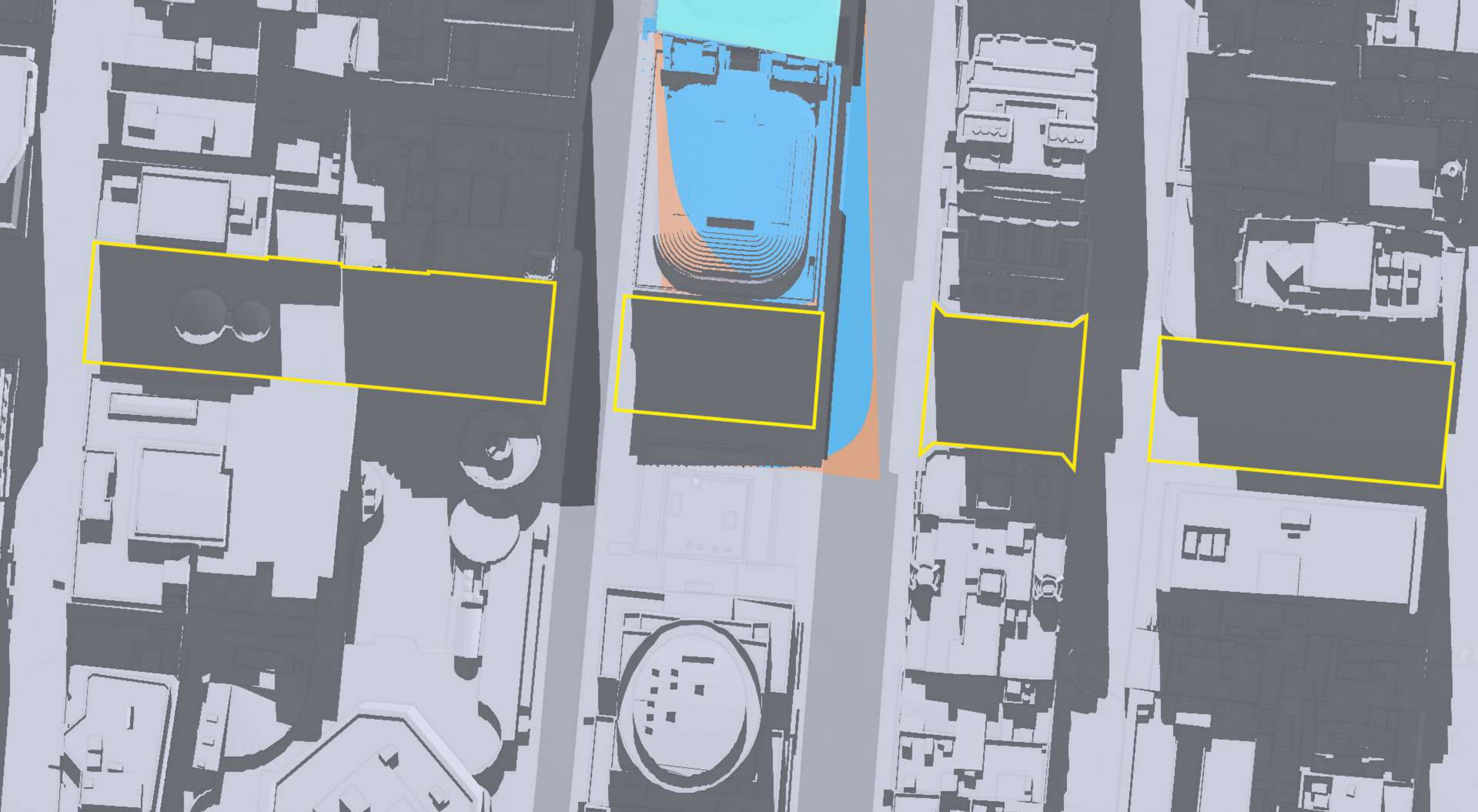


Outline of shadow cast by North Site  
Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent  
of shadow beyond existing buildings





## Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 12:00 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)

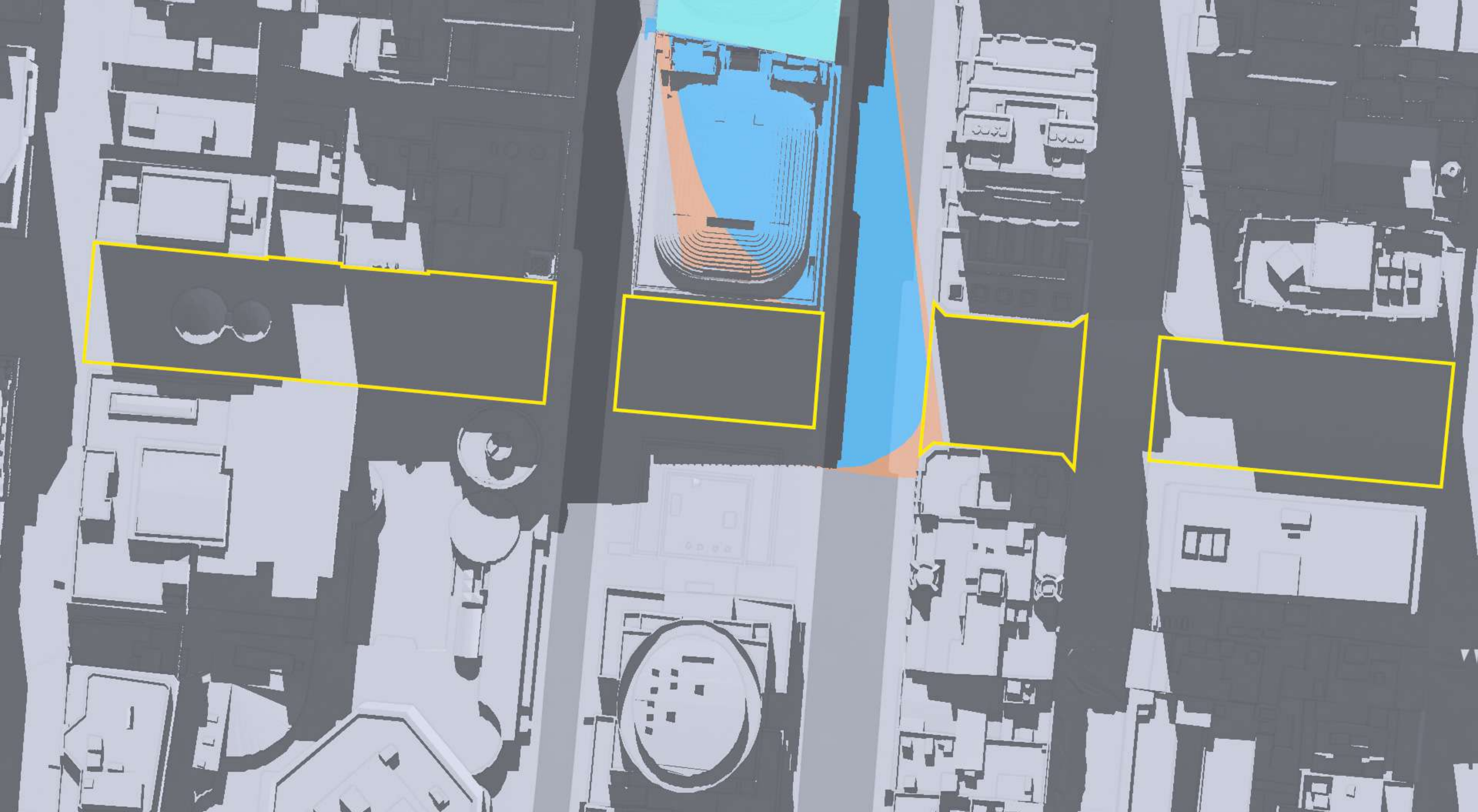


Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)





Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 12:15 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)

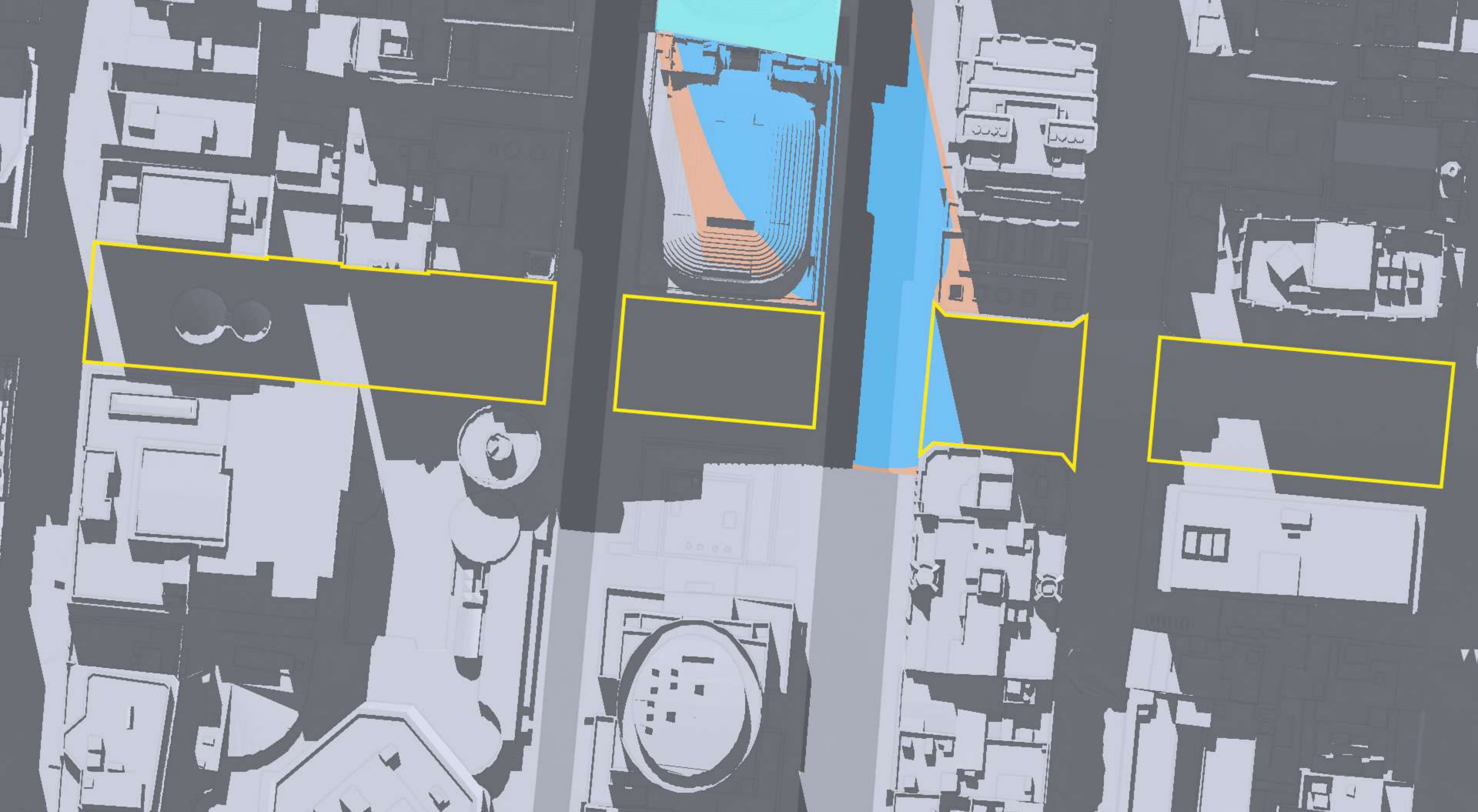


Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)





## Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 12:30 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)

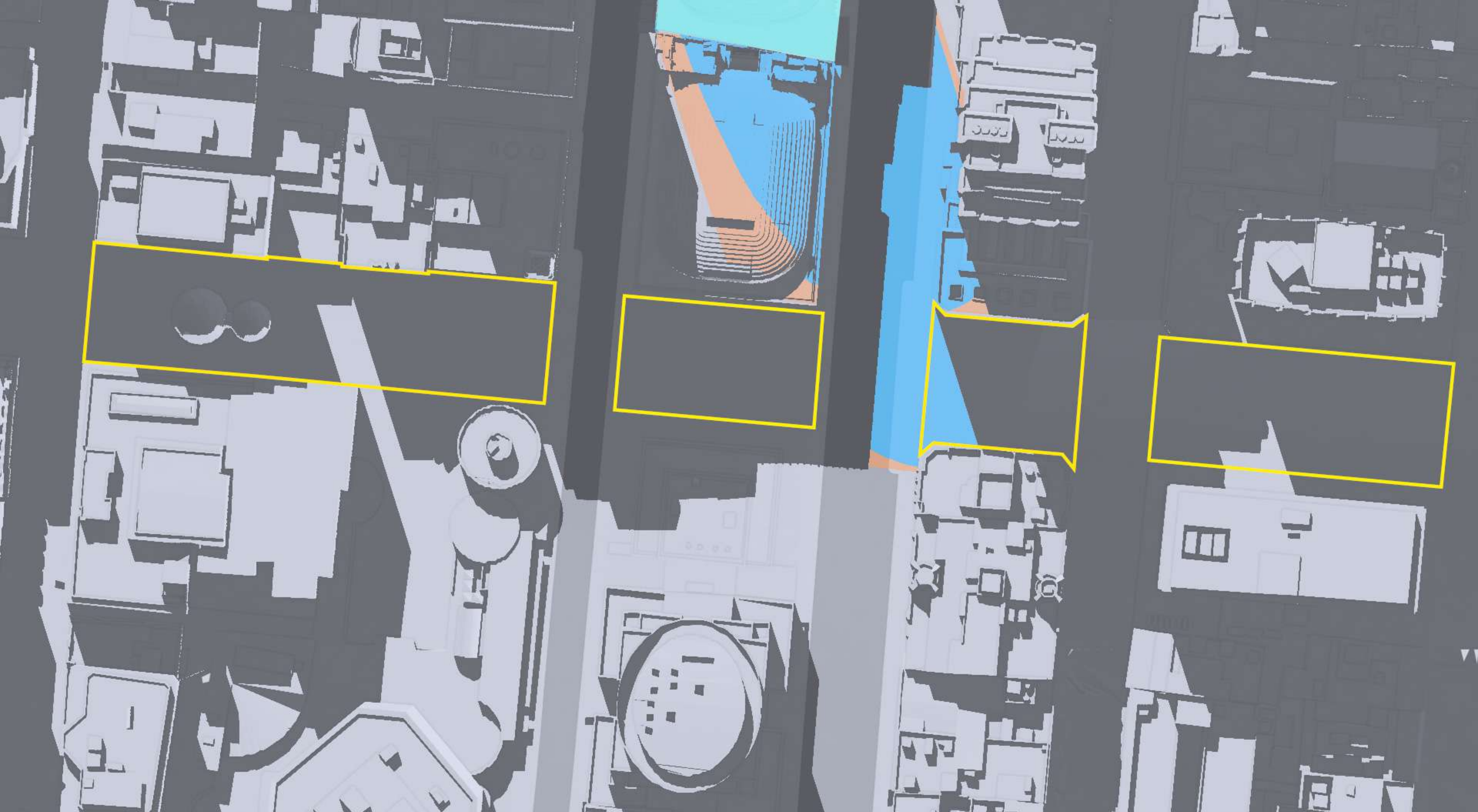


Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)





## Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 12:45 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)

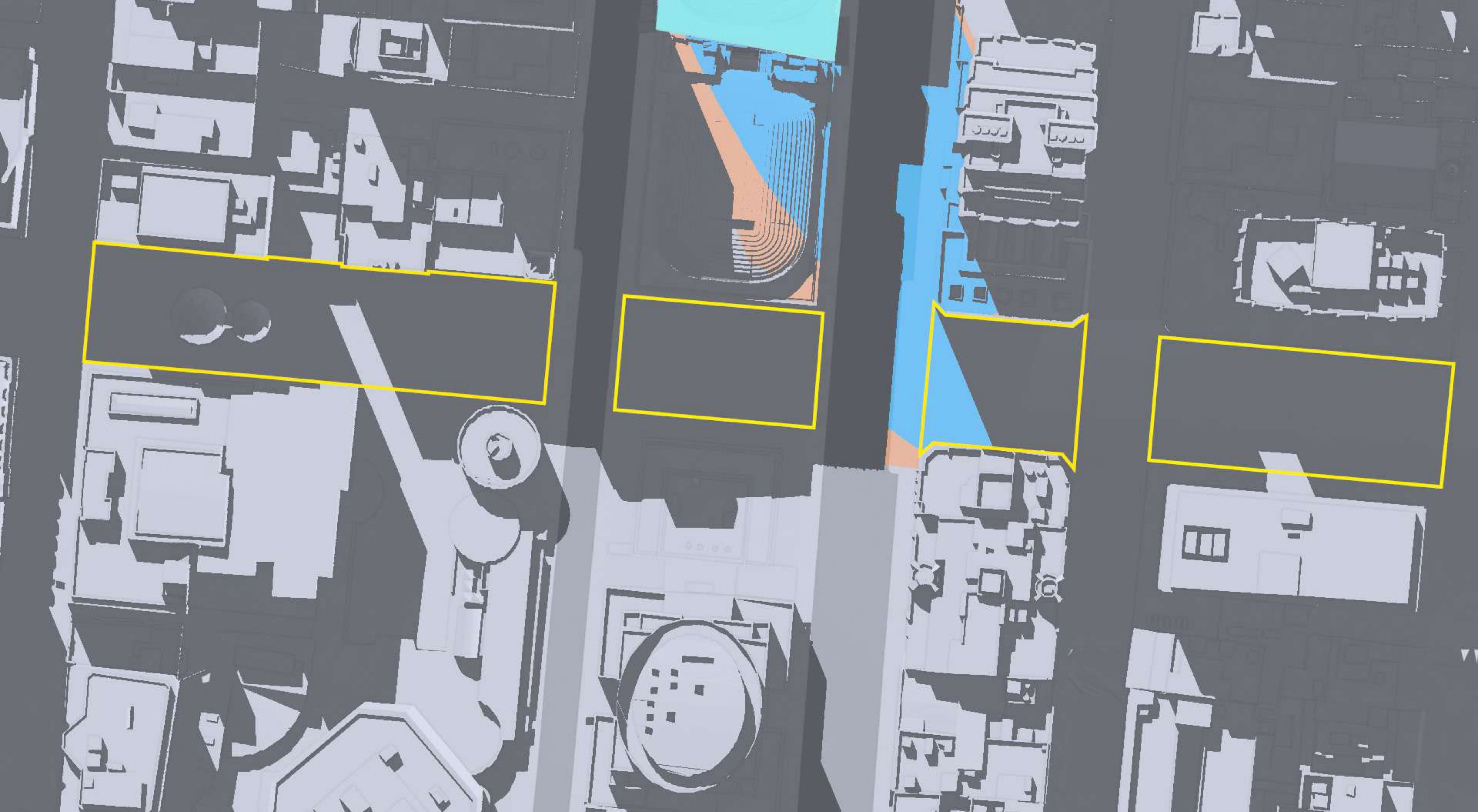


Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)





## Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 1:00 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)

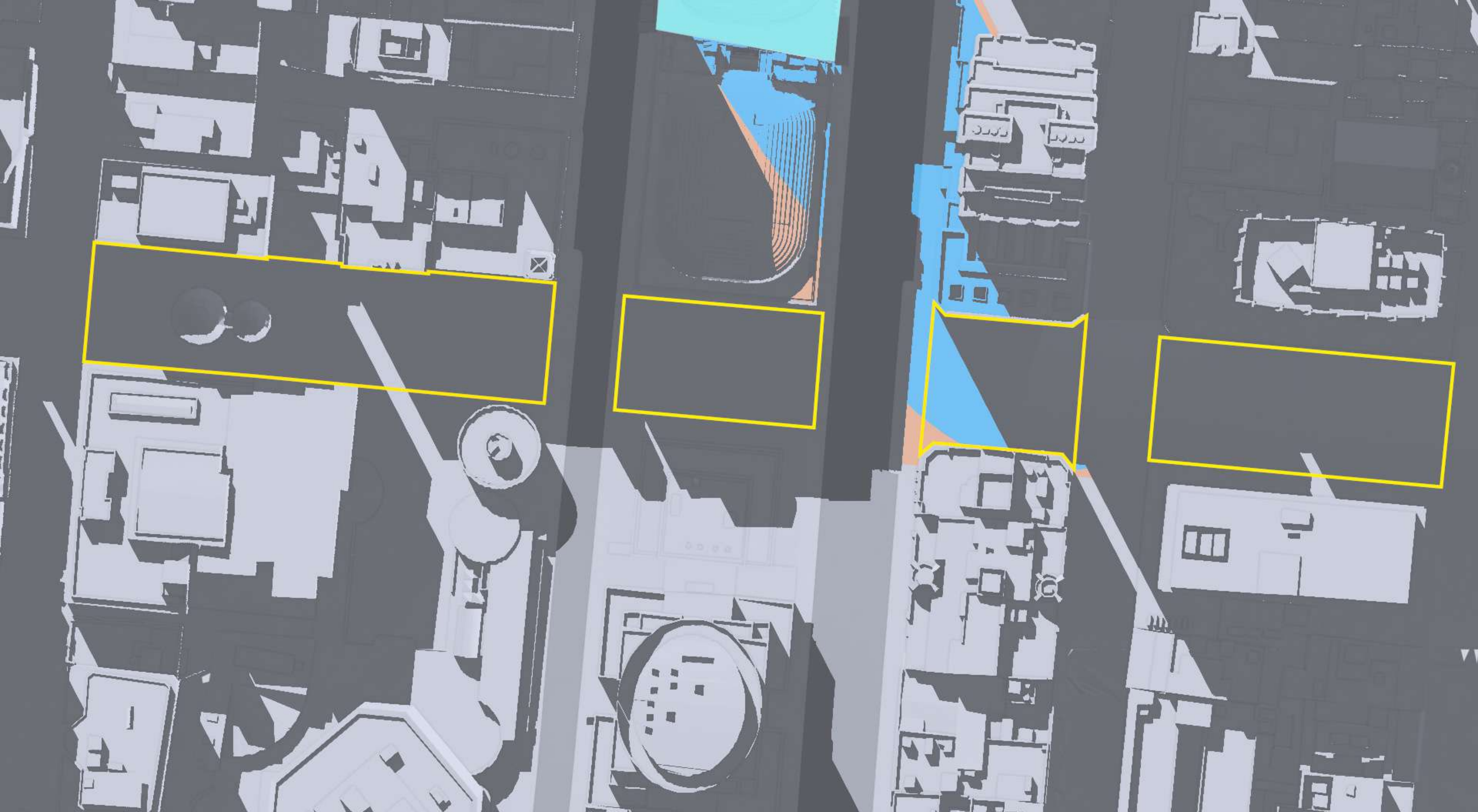


Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)





## Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 1:15 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)

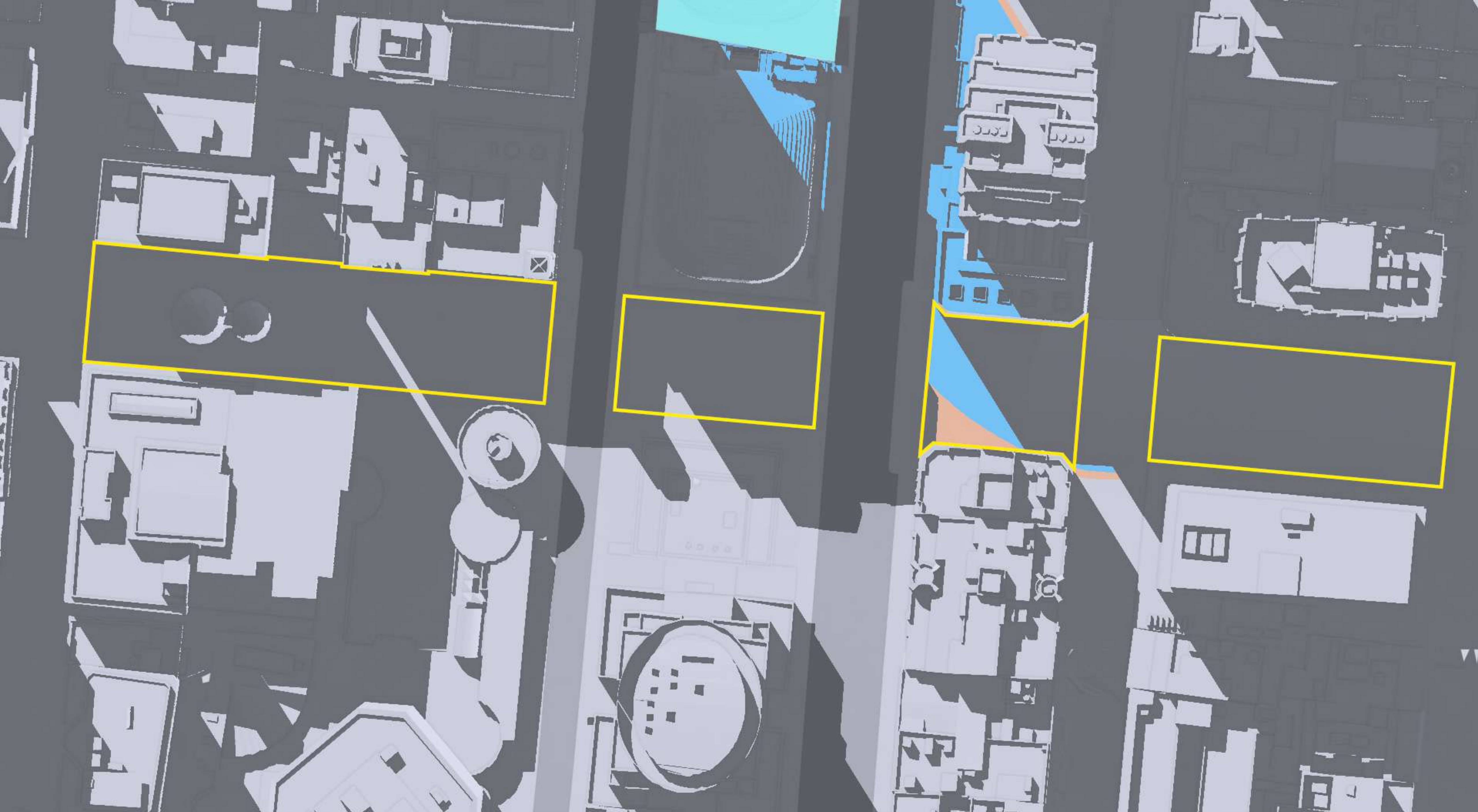


Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)





Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 1:30 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)

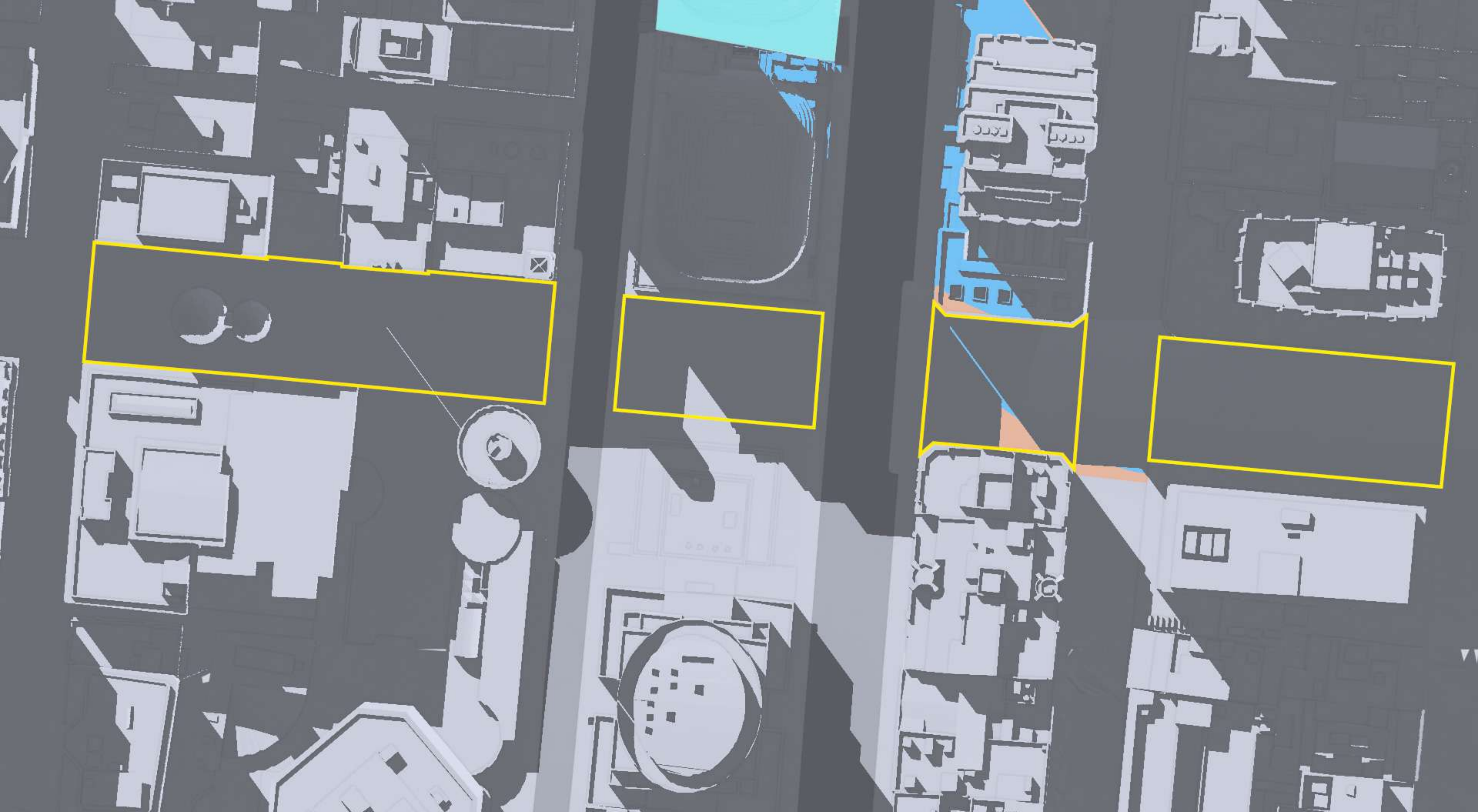


Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)





Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 1:45 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)

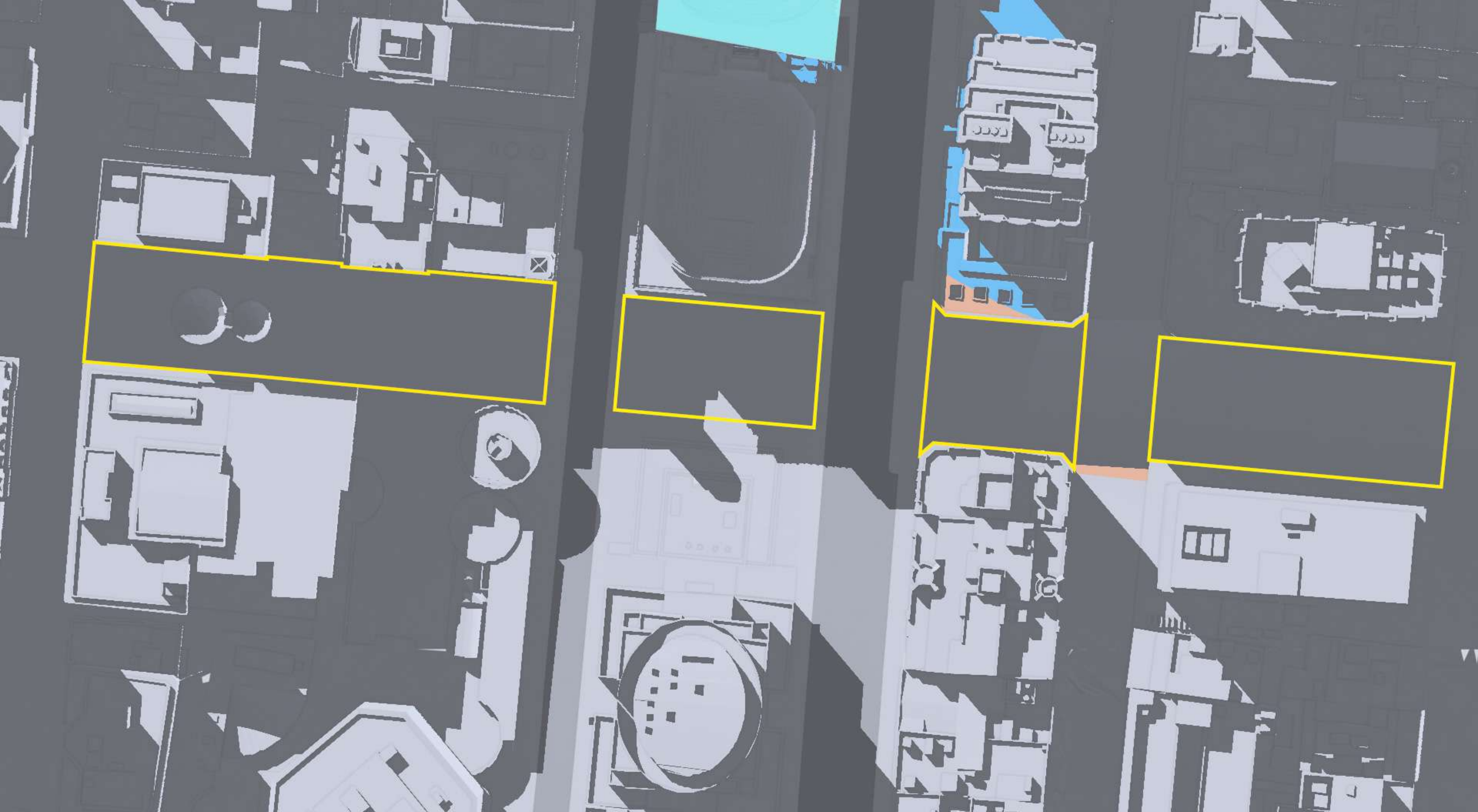


Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)





Stage 2 SSD DA Shadow Study – North Tower: Martin Place

14 April, 2:00 PM AEST



Shadows cast by existing buildings



Shadow cast by North Site Stage 1 SSD DA building envelope



Stage 2 SSD DA North Tower extent of shadow beyond existing buildings



Ground plane of Martin Place (as defined by Sydney Local Environmental Plan 2012)



Stage 2 SSD DA North Tower footprint



Overlay of shadows cast by approved North Site Stage 1 SSD DA building envelope and proposed Stage 2 SSD DA North Tower (comparison provided as defined by Condition B2(b) of Concept Approval SSD\_8351)